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ENGINE STORAGE

# Nova Scotia Technical College Calendar



Halifax, N. S.

1920

1921



## 1920.

September 11, Saturday, Registration for Civil Engineering Summer Camp.

Sept. 13 to Oct. 2, Civil Engineering Summer Camp.

Oct. 4, Monday, Registration for College Classes.

October 5, Tuesday, Beginning of Lectures.

December 24 Friday, Beginning of Christmas Holidays.

## 1921.

January 4, Tuesday, Resumption of Lectures.

January 4, Tuesday, Beginning of Short Courses.

January 31, Monday Beginning of Mid-year Examinations.

February 9, Wednesday, Beginning of Second Semester.

March 31, Thursday, Closing of Short Courses.

May 11, Wednesday, Beginning of Final Examinations.

May 23, Monday, Commencement Day.

May 24, Monday, Beginning of Summer Vacation.

May 24, Monday, Beginning of Summer Mining School.

June 18, Saturday. Closing of Summer Mining School.

**PROVINCE OF NOVA SCOTIA.****Council of Public Instruction.**

- Hon. G. H. Murray, M. P. P., Premier and Provincial Secretary.  
 Hon. O. T. Daniels, M. P. P., Attorney-General.  
 Hon. E. H. Armstrong, M. P. P., Commissioner of Public Works and Mines.  
 Hon. H. H. Wickwire, Minister of Highways.  
 Hon. Jason M. Mack, M. L. C.  
 Hon. G. E. Faulkner, M. P. P.  
 Hon. R. M. McGregor, M. P. P.  
 Hon. William Chisholm, M. P. P.  
 Hon. R. E. Finn, M. P. P.  
 A. H. MacKay, LL. D., Superintendent of Education, Secretary.

**NOVA SCOTIA TECHNICAL COLLEGE.****Board of Governors.**

- Dr. F. E. Wheelock, Acadia University.  
 Prof. A. A. Sturley, University of King's College.  
 Dr. H. E. Bigelow, University of Mount Allison College.  
 Rev H. P. McPherson, D. D., University of St. Francis Xavier College.  
 Rev. Bro. Cornelia, St. Mary's College.  
 Prin. F. H. Sexton, Nova Scotia Technical College.  
 Prof. R. P. Donkin, Nova Scotia Technical College.  
 Prof. F. R. Faulkner, Nova Scotia Technical College.  
 Prof. S. N. Graham, " " " "  
 Prof. J. F. Lumsden, " " " "

NOVA SCOTIA TECHNICAL COLLEGE

**Instructing Staff**

- F. H. Sexton, LL.D., D. Sc., Principal.  
 F. R. Faulkner, A. B., S. B., Prof. of Civil Engineering.  
 S. N. Graham, S. B., Prof. of Mining Engineering and Metallurgy.  
 J. F. Lumsden, S. B., Prof. of Electrical Engineering.  
 R. P. Donkin, S. B., Acting Prof. of Mechanical Engineering.  
 G. F. Murphy, B. E., Asst. Prof. in Mining Engineering and Metallurgy.  
 W. G. Hardy, S. B., Asst. Prof. of Civil Engineering.  
 Judge W. B. Wallace, Lecturer in Law of Contracts.  
 A. F. Barnes, S. B., Lecturer in Electrical Engineering.  
 Lecturer in Military Science.  
 H. Piers, Librarian and Curator of the Museum.  
 L. B. Taylor, Accountant.  
 E. H. Nauss, Secretary.  
 M. G. Doyle, Engineer.

### **Main Building.**

The main building of the Technical College, which contains the lecture rooms, science laboratories, museum, library, gymnasium, and assembly hall, has been completed eleven years. It is an imposing building of pressed red brick and free stone, erected on the military property adjoining the Court House on Spring Garden Road in Halifax. The main structure is 146 feet long 48 feet wide, and has two wings, 41 by 52 feet.

In the basement, room is provided for a workshop, fan room, store room, assaying laboratory, balance room, metallography laboratory, locker room, cement laboratory, and gymnasium.

The first floor contains the administration offices, museum, curator's office, geological laboratory, lecture rooms, electrical measurements laboratory, electrical research laboratory, dark room, and heat laboratory.

On the second floor are the staff offices, library, chemical laboratory, chemical research laboratory, lecture room, drafting rooms and assembly hall. The building has a steel frame, reinforced concrete floors, and is of slow-burning construction throughout.

### **Engineering Laboratories.**

The main building for the engineering laboratories was erected in 1909. This building, 40 by 160 ft., contains the central power plant, mechanical engineering laboratory, machine shop, materials testing laboratory, and hydraulic laboratory.

During the year 1911 the Murray Laboratory of Mining and Metallurgy was completed and the equipment partly installed. The details of the laboratory and equipment are given in the following paragraphs:

This is a brick, steel, and concrete building, 100 ft. square and two stories in height.

Space has been provided for a sample grinding room, supply room, workshop, lecture room, drafting room, testing laboratory, office, and lavatory. The main portion of the building consists of one large open space which is devoted to metallurgical and ore dressing processes.

The equipment for sample grinding consists of 1 Braun Chipmunk Crusher, 1 Braun Disc Pulverizer, 1 Braun Rotary Hand Grinder, 1 Allis-Chalmers Type B Sample Grinder, 1 Gates Sample Crusher, Type F. This sample grinding apparatus is driven by an independent 5 H. P., three phase, Westinghouse motor.

The equipment for metallurgy consists of a blast furnace for smelting lead and copper ores, a hand reverberatory roasting furnace, an English cupelling furnace, a copper refining furnace, experimental cyanide plant, a pot roaster, a Bessemer convertor for copper mattes, a small coking oven, etc.

The ore dressing, equipment consists of a coal washing plant as manufactured by the Jeffrey Mfg. Co., for the United States Government Coal Testing Laboratory, 1-7" x 10" Blake Rock Breaker, 1 Type O D Gates Gyratory Breaker, 1-5' Huntington Mill, 1 set 10" x 12" laboratory crushing rolls, 1-6" vertical mill elevator, 1 set standard trommels, 1-2 compartment laboratory Hartz jig, 1 Richards Pulsator jig, hydraulic cone classifiers, 1 half-size Wilfley concentrating table, 1 Standard 4' Frue suspended vanner, 1 James Slime Table, 1-five stamp mill with 450-lb. stamps and Hendy Challenge Feeder, 1 Frenier Sand Pump, 1 magnetic separator, 1 Abbe Ball Mill.

There is installed in the building a model mine plant with a 30 h. p. upright tubular boiler, 1-10'' x 10'' x 10'' Ingersoll straight line compressor, 1-5'' x 6'' Lidgerwood friction hoist with 10' drum. It is planned to make every student in Mining Engineering thoroughly familiar with these fundamental machines before graduation.

Apparatus for the testing of materials for highway construction is also installed in the Mining and Metallurgical Laboratory. This consists of 1 De Val abrasion cylinder, 1 ball mill, 1 Olson standard impact testing machine, 1 Olsen Page cementation briquette former, and 1 Olsen Diamond saw.

In this Mining and Metallurgical Laboratory industrial research on the mineral resources of the provinces is carried on as well as the instruction of college students in Mining Engineering.

### **College Government.**

The Governing functions of the Nova Scotia Technical College are vested in a Board of Governors and the Council of Public Instruction. The Board of Governors consists of one member nominated by each of the five affiliated Colleges and universities in the Maritime Provinces together with the professors of the teaching staff of the Technical College.

This Board makes all regulations in regard to admission requirements, general curriculum, and other matters which concern the general standard and welfare of the College. The Board of Governors is under the supervision and control of the Council of Public Instruction, and all regulations made by the former body must receive the ratification of the latter.

### **Affiliation.**

The Nova Scotia Technical College is affiliated with the following universities,—Acadia, Dalhousie, King's, Mount Allison, St. Francis Xavier and St. Mary's. By the terms of the affiliation, the separate universities offer a uniform course in engineering covering the first two years, and the Technical College offers professional courses in several departments of engineering covering the last two years of a four year course. Students from the separate universities are admitted to the Technical College on certificate without examination under certain conditions enumerated later. The matriculation requirements for entrance into the uniform engineering course of the separate colleges are also uniform and are set forth in the succeeding paragraph.

### **Admission to the First Two years Engineering Course in the Affiliated Universities.**

Applicants for admission must have attained the age of 16 years.

The following is an outline of the subjects and the standard or grade in each subject which is required for admission as a regular engineering student:

1. *Arithmetic and Algebra.*

Arithmetic.

Algebra, as in Grade XII, or equivalent.

2. *Geometry and Trigonometry.*

Geometry as in Grade XII, or equivalent.

Trigonometry: Plane Trigonometry, as in Grade XII, or equivalent.

3. *English.*

As in Grade XII, or equivalent.

4. *French or German.*

As in Grade XI, or equivalent.

5. *History.*

As in Grade XI, or English and Canadian History.

## 6. One of the following:

- (a) *Latin*, as in Grade XI, or equivalent.
- (b) *Greek*, as in Grade XI, or equivalent.
- (c) Additional work, equivalent to that required for Grade XII, in the language chosen in Subject 4.

### **Regulation for Students Conditioned in Matriculation.**

"No student shall be admitted to the full work of the first year of the engineering course who is deficient in mathematics, or more than one other matriculation subject. Any student who has more conditions than outlined above may enter College and take a combined Arts and Engineering Course, provided that he can satisfy the matriculation requirements of that college. Such a person can not be considered a regular first year student in engineering, and will require three years of work to complete the first two years of the engineering course. All matriculation requirements must be removed before the student can enter the second year of the engineering course."

In plain language this means that a sharp distinction shall be drawn between the regular student who has passed all matriculation requirements, and a student who has not obtained the required standard. Any student who fails in matriculation examinations in Mathematics, or in more than one subject, will have to take another year in the Academy and pass the Grade XII examinations, or else he may enter College as a conditional student and take up in the first year Arts Course the subjects in which he was conditioned.

It is better for the average student to spread the first two years engineering course over a period of three years, so that he may be better grounded before entering the Technical College and it is earnestly recommended that students should pursue this method.

### **Admission to the Technical College.**

Applicants must have attained the age of eighteen years.

The students who enter the Technical College will be classified as *regular* or *special*. Regular students are those who are full candidates for degrees, and special students are those who voluntarily, or by reason of not having passed all requirements up to the time of classification, are taking special courses.

Admission to the Technical College will be on certificate from the properly authorized officer of the university at which the student has pursued his first two years of the engineering course. The certificates must state the subjects taken, the marks made in each subject, and the pass mark required at that university in engineering courses. Certificate blanks will be furnished on application to the Principal of the Technical College.

*Regular* students will be admitted to the Technical College who have secured the required proficiency in *all the courses* of the first two years Engineering Course as hereafter outlined.

Special students will not be permitted to take more than three courses simultaneously if they wish their work to count toward a degree.

**Note**—The following temporary exception has been adopted:

Regular students will be permitted to enter the Technical College who are *conditioned in one subject only* of the first two years course, provided that that subject is not one of the following:

*Mathematics, Physics, Chemistry, Surveying or Drawing.*

The right however, is reserved to exclude as a regular student anyone who has failed in any other subject of the preliminary course than those specified above.

### **Admission to Advanced Standing in the Technical College.**

Any person may be admitted to advanced standing in the Technical College by passing such examinations as are deemed necessary by the College faculty, or by submitting such certificates of previous records of study or experience as shall satisfy the faculty. All applications for special examinations for advanced standing must be made to the principal of the college before September 1st, 1918.

Any person on the payment of the required fee and the production of evidence to the faculty of sufficient knowledge and training to benefit by the instruction in

any separate class or classes given in the Technical College, may enter and pursue such class or classes as a special student.

### Degrees.

To whomsoever shall satisfactorily acquire the requisite proficiency in all the regular courses of either Civil, Mining, Mechanical, or Electrical Engineering as prescribed in this calendar shall be given by the Technical College a degree of Bachelor of Science in that department in which he has pursued his studies. The degree of Bachelor of Science may also be awarded by the Faculty on the basis of examination alone or for work considered the full equivalent of the engineering courses.

### Certificates.

Any one attending one or more classes in the Technical College and attaining the requisite standard of proficiency in said class or classes shall, on application, receive a certificate attesting to the exact work done.

### Tuition Fees, Deposits, Etc.

The tuition for instruction in any regular department of engineering shall be seventy-five dollars. (\$75) per year, forty dollars of which shall be paid within one month from the opening in September and the remainder during the first month of the second term, which begins usually in February.

To those who are attending special classes the fees are as follows:—

For any single class for one-half year . . . . .	\$ 7.50
“ any single class for one whole year, or for	
two classes for one-half year . . . . .	12.00

For three classes for one half year.....	18.00
“ four “ “ .....	23.00
“ five “ “ .....	28.00
“ six “ “ .....	33.00
“ seven “ “ .....	38.00
“ eight or more classes for one half-year.....	40.00
“ seven or more classes for whole year.....	75.00
Short Courses, each.....	15.00

An advance deposit of \$5.00 will be required of all students taking laboratory classes on entrance to the same to cover breakage or damage to apparatus. An itemized account of supplies or damages will be rendered at the end of year for settlement.

### Scholarships.

#### *Engineering Courses.*

There is one free scholarship of a value of seventy-five dollars, (\$75.00) for each of the eighteen counties of Nova Scotia, except the counties of Halifax and Cape Breton, for which there are two free scholarships each. These scholarships are to be awarded on the basis of need and merit after the results of the mid-year examinations. The applications for scholarships must have been *bona fide* residents for more than three years in the county for the scholarships for which they are seeking. If there is no applicant in any one year for a certain scholarship, a student, resident in any other county for more than three years previously may by permission of the Faculty apply for the vacant scholarship and may be awarded the same by the Faculty.

**Short Courses.****First Two years Uniform Engineering Courses in  
the Affiliated Universities.**

Acadia, Dalhousie, King's, and St. Francis Xavier have amended the two years' uniform engineering course in their respective universities. Following is the outline of the amended courses as they will be carried out after September, 1911, in the above colleges:

**I. Mathematics—**

1. Solid Geometry . . . . . 24 hours.
2. Analytical Geometry . . . . . 48 hours.
3. Calculus: Differential and Integral 96 hours.

**II. Chemistry—**

1. Gen. Chemistry: Lectures . . . . . 72 hours.
2. Gen. Chemistry: Laboratory . . . . 96 hours.
3. Qualitative Analysis: Lectures . . . 24 hours.
4. Qualitative Analysis: Laboratory . . 96 hours.

**III. English—**

1. English Composition . . . . . 48 hours.

**IV. Drawing—**

Freehand: Mechanical and Machine  
Drawing . . . . . 240 hours.

**V. Physics—(including Mechanics,  
Electricity, Heat, Light, and Sound.)**

1. Lectures and Recitations . . . . . 120 hours.
2. Laboratory . . . . . 120 hours.

**VI. Surveying—**

1. Lectures..... 48 hours.
2. Field work, Mapping, and Topographical Drawing.....144 hours.

**VII. Descriptive Geometry—**

Lectures, Recitations and Drawing.. 72 hours.

**VIII. General Geology—**

Lectures..... 48 hours.  
Laboratory and Field Work..... 72 hours.

**IX. Kinematics—**

Kinematics of Machines..... 72 hours.

**X. Workshop.....216 hours.****Prerequisites.**

Students who are entering the Technical College and are deficient in any of the required entrance subjects will not be allowed to take any course for which that subject is a prerequisite.

Any student who wishes to take a special course in the Technical College must have previously passed the course which will enable him to benefit by the advanced instruction. The prerequisites for the regular courses are given in the following table:—

Mechanics of Engineering.	Mathematics and Physics.
Railway Location.....	Trigonometry and Surveying.
Thermodynamics.....	Mathematics and Physics.

Advanced Surveying.....	Trigonometry and Surveying.
Roads and Pavements....	Surveying and Trigonometry.
Machine Design.....	Drawing and Kinematics of Machines.
Electrical Machinery.....	Physics.
Electrical Laboratory....	Physics.
Applied Geology.....	Geology.
Quantitative Analysis....	Chemistry.
Principles of Metallurgy .	Chemistry.
Mine Surveying.....	Surveying.
Mechanical Engineering Laboratory...	Kinematics of Machines.
Assaying.....	Chemistry.
Mineralogy.....	Chemistry and Geology.

If a student, however, wishes to study some special course and does not wish to count this towards a degree he may be allowed to take such course at the discretion of the Faculty of the Technical College upon his presenting a signed statement that he does not wish the work to count towards a degree.

### Engineering Camp.

A united engineering camp for students between the second and third and the third and fourth years will be held in some place to be selected in Nova Scotia, September 13th to October 2nd, 1920. There will be required a deposit of eighteen dollars (\$20) for this class to be paid on entering the camp.

### Short Courses.

The Technical College offers special short courses each year during the months of January, February and March. These courses are planned for the needs of men in indus-

tries who have not had the opportunity to take a full engineering course but who desire special technical instruction in order to advance themselves in their vocations.

Short courses are given in the following subjects:-

- Land Surveying.
- Steam Engineering.
- Machine Design.
- Agricultural Drafting.
- Structural Steel Drafting.
- Electrical Machinery.
- Coal Mining Engineering.
- Metallurgy of Steel.
- Technical Chemical Analysis.
- Assaying.

A special pamphlet with a full description of the courses will be sent upon application.

### **School of Navigation.**

The Federal department of Marine and Fisheries co-operates with the Technical College in maintaining a School of Navigation for seaman. The courses of study are adapted for those who wish to obtain government certificates of competency on vessels in inland waters and minor waters, coasting vessels, and deep sea vessels in the mercantile marine. Instruction is given to enable the man with the requisite amount of service to secure a certificate of master for transatlantic liners. The school is open every day except Sunday and every week-day evening except Saturday all the year round. Tuition is free and each person receives individual instruction. Further particulars are set forth in a special pamphlet which will be sent on request.

## EQUIPMENT.

A great deal of time and thought has been spent on the equipment for the various laboratories to select a good thorough, up-to-date assembly of apparatus for teaching purposes. The apparatus as far as it has been purchased already, is given below.

### Civil Engineering

*Surveying Instruments.*—Queen Transit., 2 Gurley transits, 1 Buff and Buff transit, 1 Keuffel and Esser mining transit, 1 Buff and Buff triangulation theodolite, 1 Buff and Buff Wye level, 2 Gurley levels, 1 Buff and Buff Dumpy level, 1 Stanley level, 1 Keuffel and Esser level.

*Testing Machines.*—One hundred thousand pound capacity testing machine, extensometer for tension and compression improved deflection instrument improved dial deformeter, Gilmour needle, Briquette Moulds, Le Chatelier specific gravity apparatus, Olsen's compression micrometer, encased abrasion cylinder, 2,000 lb. traction dynamometer, 50,000 lbs. hydraulic compression testing machine, traverse tester of 10,000 lb. capacity, 60,000 inch-pound torsion testing machine.

### Electrical Engineering

A great deal of the apparatus of the Electrical Department is used jointly with the Mechanical Engineering Department. The larger units are in the Engineering Laboratories building and the others in the main building in the Dynamo Laboratory in the Electrical Measurements Laboratory, and in the Storage Battery Room.

The main power-unit is a 50 K. W. 3-wire d. c. generator, 220-110 volts, direct connected to a Robb

automatic cut-off 10" x 12" high-speed engine. This set is wired up so as to supply direct current to the laboratories, and for light and power in all the buildings. In addition, there are connections to the Halifax Electric Tramway Companies lines through two transformers; one supplying 220-volt 3-phase 60-cycle current for power, and the other 3 wire, 220-volt 60-cycle current for lighting the buildings. In the Dynamo Laboratory is a generator set consisting of a Can. Westinghouse Co. 3-phase induction motor directly connected to a D. C. Generator 110 volts, 42 amperes of same make supplying 110 volts. This set is connected to the permanent wiring of the building for supplying D. C. when the need is not sufficient to demand running the main unit. Its energy is drawn from the Halifax Tram Company's mains, 220 volts, 3-phase.

In the Engineering Laboratory are also located the hand and power tools comprising the machine-shop equipment. Power for the shop is supplied by a motor belted to a line shaft. The college shops are not intended as part of the teaching equipment directly but are used principally for the repair and manufacture of apparatus and equipment. In addition to the machine shop drive, other electrical machines in the Engineering Laboratory are two 5 H. P. motors direct connected to turbine and centrifugal pumps, and another of the same size belted to a small air-compressor. There is also a Canadian General Electric Co. Edison bipolar generator 125 V., 25 K. W. which can be belted to any one of several engines and used as a load or tested as a generator or motor. Other motors in this building are used to drive various testing machines; all are for 220 volts D. C., taking power from the outside wires of the main generating set. This building also contains the main switchboard with a complete equipment of indicating and recording instruments, leakage indicator, circuitbreakers, and switches.

In the Dynamo Laboratory are: one Fairbanks motor-generator set, compound wound, consisting of two similar 220-volt D. C. 5. H. P. dynamos either of which can be run as a motor driving the other as a generator; the Westinghouse A. C.-D. C. motor-generator set before mentioned; one special laboratory rotary convertor with six slip-rings, capable of a great variety of experimental work; two Canadian General Electric 5 H. P. 3-phase A. C. dynamos with extra rotors also capable of operation in various ways as motors or generators; 2-shunt and 2 series C. G. E. motors, 5. H. P. 110 volts, which can be run on brake-load, belted to other machines or direct connected as desired. There are also a Can. Westinghouse 5 H. P. single-phase A. C. motor a C. G. E. single phase repulsion motor of about the same power; a Lincoln variable-speed D. C. motor with a wide range; and a number of small motors and generators, A. C. and D. C. single-phase and three-phases.

Nearly all the above machines are mounted on heavy tables with steel frame-work supports, bringing them to a convenient height for observation, examination or adjustment; and while most of them are large enough so that the parts are on a good, sturdy, visible scale, it is nevertheless not difficult to move them about from place to place, and to make new connections, mechanical or electrical, for various experiments. The motors can be loaded by brake, by direct connection, or by belting; and the generators by lamp-bank, direct or a belt connection, or water rheostat. There are three lamp banks; one of 250 volt 16 c. p. carbon incandescent lamps; one of 125-volt 32 c. p. lamps, and one of 125-volt 16 c. p. lamps. Each contains about 190 lamps with switches for throwing in any desired number or combination.

The Dynamo Laboratory also contains the cases where the usual measuring instruments are kept.

This equipment is exceptionally complete, comprising a wide range of voltmeters, ammeters, and wattmeters, principally of the Weston make, for direct and alternating current, including a number of shunts, multipliers, series and potential transformers, etc. There are four Starrett and two Schaeffer and Budenburg speed indicators; several mechanical tachometers, one Weston electric tachometer and one Hopkins electric speedometer. There is also an ample assortment of slide-wire manganin rheostats, and standard field resistance rheostats; and each motor of any size is provided with suitable starting resistance or compensator. This Laboratory also contains a special laboratory switch board in two panels. It is provided with 3 Weston D. C. switchboard Ammeters and 2 Weston voltmeters, with three integrating wattmeters. The front terminals are in the form of sockets, and flexible cables with end plugs are used thus making almost any combination of connections possible. There is also a number of circuit-breakers, switches, and fuses, and the charging and discharging connections and switches for the storage battery. Adjoining the switchboard is a ten ampere C. G. E. mercury arc rectifier; and in this room are kept a number of standard and special transformers, in size from 75 K. W. down, some being provided with a great number of taps, and mounted in portable stands with terminal boards for plug connection.

In the Electrical Measurements Laboratory are kept the more delicate laboratory standard and precision instruments. These include a number of fine instruments of Siemens-Halske make, a Western laboratory-standard millivoltmeter with shunts and multipliers, bridges of various makes, Leeds and Northup potentiometer, electric pyrometers, galvanometers, standard resistances and all other essential instruments for close and accurate work. In this room are located a powerful spark coil with electrolytic interrupter and controlling resistance by Siemens—Halske, and used for

X-ray and similar experiments, and a large number of parts of standard electrical machines for illustrative purposes; also a fine G. E. oscillograph for both visual and photographic work.

In the basement is the battery-room, with a 60-cell Westinghouse storage battery, end cell regulation and a number of other batteries, primary and secondary; and between the Dynamo and Electrical Measurements Laboratories is the dark room with a 72" cylindrical electric blue-print machine made by Keuffel & Esser with Adams-Bagnall 15 amp, enclosed a. c. arc lamp and regulating compensator, and a large Elliot photometer. The laboratories also contain samples of all the more common electrical appliances in general use, such as wiring fixtures, sockets, conduits, switches, different sorts of insulated wire and cable, various types of arc and incandescent lamps, telephones, telegraph, instruments, dry and wet batteries, scales and balances, micrometers, machinists' and electricians' tools, fuses, and spare and repair parts for many of the machines and appliances. None of the apparatus is cheap or unreliable, and students are free to use any of the equipment under proper direction and care when they are sufficiently advanced to understand how to handle it intelligently. No voltage higher than 220 is obtainable without special connections, so there is practically no danger to any student working in the laboratories, unless he deliberately tries to hurt himself.

### **Mechanical Engineering.**

The main units in the mechanical laboratory are located in the Engineering Laboratories building. Power is derived from two horizontal return tubular boilers of 80 h. p. each, which in addition supply heat to all the buildings. These are hand-fired, natural and forced draft, and may be fed by either injectors or feed

pump. They are supplied with the usual accessories for testing. The returns from the heating system are fed back automatically into the boilers by the Bundy double-acting trap systems; there is also a Cochrane open-heater used with the feed pump for feeding hot water when any of the steam-units are running. These latter are as follows:—

One horizontal cross-compound non-releasing Robb Corliss automatic cut-off engine with cylinders 12" x 20" stroke, having especially wide range of adjustment of governor and valve gear, and built by the International Engineering Works of Amherst, N. S. (Formerly Robb Engineering Co.) This engine is designed for a normal load of 150 h. p. con-condensing to about 220 h. p. condensing, at 180 r. p. m. There are two pulleys for taking off power by belt, and the L. P. Side has the shaft extended through an out-board bearing carrying a flange-coupling for direct-connection to dynamometer or other load. In addition the main pulley, which serves also as a flywheel is equipped with a water-cooled brake as made by the Westinghouse Machine Co, of ample capacity to absorb the full power of the engine. This is a direct 8" exhaust to the atmosphere, and a 9' exhaust to surface condenser, also a 4" connection to the heater.

One automatic high-speed engine, Robb make, 75 h. p. 10" x 12" direct connected to 3 wire generator as given under Electrical Engineering. This engine can exhaust to condenser, to atmosphere or to heater, and, like the large engine is fully equipped for testing.

One 10 h. p. horizontal engine by James Leffel Co., balanced slide valve medium speed, equipped for valve setting, testing, etc.



One vertical 8 H. P. engine by I. Matheson & Co., equipped for testing.

One Kerr Steam Turbine, 20 B. h. p. at 3600 r. p. m.

One de Laval turbine, 20,000 r. p. m., gear connected to Sturtevant high-speed blower.

One Worthington surface-condenser, three-pass, 350 sq. ft. of cooling surface, mounted on stanchions over independent steam-driven vacuum pump. In addition, there is a Sims heater, 87 sq. ft. of tubes so mounted that it may be used as a surface condenser at atmospheric pressure. This heater can be used as a condenser for any of the smaller units when the evaporation under atmosphere exhaust conditions is to be measured.

In addition to the boiler feed pump and the vacuum pump belonging to the surface condenser, there are—one McDougall duplex steam pump 10'' x 6'' x 10'', one Blake duplex pump, two centrifugal and one turbine pump, motor-driven. By means of open and pressure tanks at different levels, these pumps may be driven under varying conditions of lift and pressure.

Other sources of motive power are; one Crossley oil engine of 4 h. p., hot tube ignition which may be run with various fuels; one Fairbanks-Morse 4 h. p. horizontal gas or gasoline engine; one Gray Motor, vertical two cycle engine, 12 h. p. at 600 r. p. m. (This engine can be run on gasoline or kerosene by proper changes in the carburetor.

The machine shop equipment consists of:—1 Kemp-smith No. 1 Universal milling machine; 1 McDougall 20'' shaper; 1 LeBlond precision grinding machine with cabinet of attachments; 1 Ford Smith No. 20 wet tool grinder; 1 gas oven for tempering tools and cutters; 2 LeBlond 16'' x 6' engine lathes with quick change gears and taper attachments; 2 McDougall lathes 16'' x 6' with

quick change gears and taper attachments; 3 C. M. C. lathes with quick change gears and taper attachments; 1 Davenport 22'' x 12' engine lathe with quick change gears and full equipment; 1 3 foot radial drill with automatic knock out feed and tilting table; 2 small high speed drilling machines for centering work and small drilling, 1 Bert-ram planer 6' x 24''; 1 power hack saw.

The tool room is completely equipped with all jigs, fixtures and tools required for all machines, including a complete set of milling cutters for cutting teeth in gear wheels; twist drills of both high and ordinary speed; carbon steel taps and dies for the ordinary range of work for standard bolt and pipe threads. There is also contained in the tool room 1 small tool makers lathe for fine work.

The machine shop is divided into three sections. The counter shafts for the various machines being driven by three line shafts driven by three a. c. motors.

The training received will be according to modern machine shop standards, where accuracy, neatness, and skilful manipulation of the hand tools and machines will be firmly impressed on the student.

For heat measurements there are: one Boys' standard gas calorimeter with pressure regulator and meter; Parr calorimeters for calorific value of coal; total carbon apparatus for proximate coal analysis; Ellison's throttling-evaporating calorimeter for obtaining dryness of steam; Carpenter's separating calorimeter; barrel calorimeter; calorimeter for tests on saturated steam, apparatus for determining heat radiation from lagged and bare pipes; small air-compressor with orifice box for determination of flow of air; Hay's flue-gas analysis apparatus complete with gas sampler. For general mechanical laboratory tests, one Crosby gauge tester; one Engler viscosimeter; one Venturi meter

complete as made by Builders' Iron Foundry of Providence, R. I.; one Pelton wheel; one weir fitted for experimental work; one hydraulic ram, with various heads, two large pressure tanks used in connection with various tests in hydraulics and calibration of orifices.

In addition there is a full equipment of such smaller apparatus as steam and gas engine indicators, planimeters, brakes, weighing apparatus, thermometers, speed counters, and other instruments used jointly with the Department of Electrical Engineering.

## SYLLABI OF ENGINEERING COURSES:

### DEPARTMENT OF CIVIL ENGINEERING.

The course in Civil Engineering covers four years of prescribed studies, the third and fourth of which are given at the Technical College, as outlined in the following schedule. The course is designed to give the student sound training, both theoretical and practical, in the sciences upon which professional practice is based.

Civil Engineering is the broadest in scope of the Engineering professions, being the parent stem from which have diverged the other branches, but even though these have been recognized as distinct professions, the field of Civil Engineering still remains so large that no one can become expert in its whole extent. It covers Topographical Engineering, Railway Engineering, Municipal Engineering, Structural Engineering, Hydraulic Engineering and other subdivisions. All these branches of Engineering rest, however, upon a relatively compact body of principles, and in these principles the students are trained by practice in the class-room, the drafting-room, the field, and the testing laboratory.

**101—Mechanics of Engineering I.**

*Third Year, Civil, Electrical, Mechanical, and Mining Engineering, First Semester, Five Hours per Week.*

This course involves the study of the fundamental principles of statics and dynamics and the application of these principles to the solution of numerous problems both in and out of class. Special stress is laid upon these principles most used by engineers.

Text—*Wright*:—"Elements of Mechanics."

**102—Mechanics of Engineering II.**

*Third Year, Civil, Electrical, Mechanical, and Mining Engineering, Second Semester, Three hours per Week.*

This course comprises a study of the strength of materials, including the stresses and deformations in bodies subject to tension, to compression, to shearing; the common theory of beams, including continuous beams, with thorough discussion of the distribution of stresses, shearing forces, bending moments, longitudinal shear, slopes and deflections; stresses in hooks, in columns, and in beams subjected to tension and compression as well as bending; torsional stresses in springs.

Text—*Boyd*:—"Strength of Materials."

**103—Materials Testing I.**

*Third Year, Civil, Electrical, Mechanical, and Mining Engineering, Second Semester, Three Hours per Week.*

This course comprises a series of tests of the strength and elasticity of wood, cast iron and steel, in tension,

compression, bending and torsion. This course runs concurrently with No. 102.

### 105—Structures I.

*Third Year, Civil Engineering, Second Semester, Two Hours per Week.*

This course is designed as an introduction to the study of Structures as given in the fourth year. It comprises a study of outer and inner forces, reactions, shears, moments, influence lines, concentrated load systems, and the design of beams.

Text—*Spofford*:—"Theory of Structures."

### 106—Structures IA.

*Third Year, Electrical, Mechanical, and Mining Engineering, Second Semester, Two Hours per Week.*

This course is designed to give a working knowledge of the methods used in the design of simple trusses of both wood and steel and the fundamental principles of reinforced concrete. No text is prescribed.

References:— $\left\{ \begin{array}{l} \textit{Hool}:—"Elements of Structures." \\ \textit{Hool}:—"Reinforced Concrete Construction", Vol. I. \\ \textit{Spofford}:—"Theory of Structures." \end{array} \right.$

### 111—Theoretical Hydraulics.

*Fourth Year, Civil, Electrical, Mechanical, and Mining Engineering, First Semester, Three Hours per Week.*

This course covers the principles of hydrostatic and hydrodynamic pressure, the flow of water through orifices

and nozzles, over weirs and through pipes and open channels, and the losses from friction and other sources.

Text—*Russell*:—"Hydraulics."

### 112—Hydraulic Laboratory.

*Fourth Year, Civil, Electrical, Mechanical, and Mining Engineering, First Semester, Three Hours per Week.*

This course runs concurrently with No. 111 and includes a series of experiments for determining the discharge of orifices, nozzles and weirs under varying conditions, and a determination of the co-efficients involved, determination of losses in pipes due to friction and other causes, measurements with the Venturi meter; efficiency tests of the hydraulic ram, turbine, Pelton wheel, etc.

### 119—Advanced Surveying I.

*Third Year, Civil Engineering, First Semester, Four Hours per Week.*

Lecture, field, and drafting room work covering the following; use of the stadia and plane table in topographic work; precise, barometric, and trigonometric levelling. The mapping of surveys made at the previous summer camp will be completed.

Text—*Breed and Hosmer*:—"The Principles and Practice of Surveying, Vol. II."

### 120—Advanced Surveying II.

*Third Year, Civil Engineering, Second Semester, Five Hours per Week.*

A continuation of course 120 involving the principles of practical astronomy and the determination of lat-

itude, longitude, azimuth and time with ordinary surveying instruments. Photographic surveying. The relation of geology to topography. Hydrographic surveying.

### **121—Railroad Engineering I.**

*Third Year, Civil Engineering, First Semester, Three Hours per Week.*

This course comprises a study of the mathematics of curves as used in Railroad and Street work, a study of frogs, switches, the vertical curve, the easement curve.

Text—*Allen*:—"Railroad Curves and Earthwork."

### **122—Railroad Engineering II.**

*Third Year, Civil Engineering, Second Semester, Three Hours per Week.*

A continuation of course No. 121 with particular reference to the methods used in staking out and computing earthwork, followed by a series of lectures dealing with signalling, train resistances, the influence of grades, distance, curvature, rise and fall; yards and terminals.

Reference—*Raymond*, "Elements of Railroad Engineering."

### **123-124—Summer School in Surveying.**

Three weeks of field work is carried on in camp in September preceding each of the third and fourth years. The object is to give students more extended field practice than is possible during the regular college year. It is the intention that each student shall be given practice with all the instruments used.

The work consists of topographic work with transit, stadia and plane table. From a carefully measured base line, a system of triangulation is developed for control

in plane table work. A complete survey for a short line of railroad is made. Steam gauging is carried on by means of floats and current meters. Each student is required to keep full sets of notes from which the surveys are plotted.

Students should provide themselves with blankets and bedding. A fee of \$25.00 is required for this course.

Required in Civil Engineering third and fourth years, and third year in Mining Engineering.

### **131—Highway Engineering.**

*Third Year, Civil Engineering, First Semester,  
Two Hours per Week.*

This course comprises a study of the principles pertaining to the location, construction, and maintenance of roads and highways, and the construction and maintenance of the various pavements used for city streets.

Text:—Agg—"Construction of Roads and Pavements."

### **132—Materials Testing II.**

*Third Year, Civil Engineering, First Semester, Three Hours  
per Week.*

This course runs concurrently with No. 131 and comprises a series of tests to determine the suitability of various road materials for particular conditions of traffic or location.

Materials in common use in paving will also be tested.

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**141—Masonry and Foundations.**

*Fourth Year, Civil Engineering, First Semester, Three Hours  
per Week.*

This course is devoted to the study of materials used in masonry work of all kinds and to the study of the methods of constructing foundations for bridges, buildings and other structures. The text used will be supplemented by lectures and references to contemporary technical journals.

Text—*Baker*:—"Masonry Construction."

**142—Materials Testing III.**

*Fourth Year, Civil Engineering, First Semester, Three Hours  
per Week.*

Given concurrently with No. 141, the work consists of standard tests of cement and cement mortars, tests of plain and reinforced concrete in tension, compression and bending. The course has as its object the familiarizing of the student with the ingredients of concrete, and giving some training in the selection of a proper aggregate from materials which may be at hand.

**143—Masonry Design.**

*Fourth Year, Civil Engineering, Second Semester, Three  
Hours per Week.*

One drafting period per week devoted to the design of masonry dams, retaining walls, footings and other masonry structures.

**151—Water Supply.**

*Fourth Year, Civil Engineering, Second Semester, Three Hours per Week.*

The course is devoted to a study of municipal water supply systems, their design and construction; quality of water, examination, tests and methods of purification, storage, reservoirs, ground flow, wells, pumps, stand-pipes, water towers, conduits, distribution systems, a study of the quantity required per capita and the variations with diverse conditions.

Text—*Turneure and Russell*:—"Public Water Supplies."

**153—Hydraulic Engineering.**

*Fourth Year, Civil, Electrical and Mechanical Engineering, Second Semester, Three Hours per Week.*

The course embraces a detailed study of rainfall, run-off, storage and delivery of water and the design and construction of structures for water power works. Included in the course is a critical study of the principles of water wheels and turbines.

Text—*Mead*:—"Water Power Engineering."

References:— { *Hoyt and Grover*—River Discharge.  
                  { *Daugherty*—Hydraulic Turbines.

**154—Hydraulic Design.**

*Fourth Year, Civil Engineering, Second Semester, Three Hours per Week.*

This course is devoted to the study of a particular water power plant. The student starts with the stream measurements and is led, step by step, to the general design of the plant and the selection of the proper machinery.

**162—Sewerage and Sewage Disposal.**

*Fourth Year, Civil Engineering, Second Semester, Three Hours  
per Week.*

A course devoted to the study of the quantity and character of sewerage, various systems for the removal and purification of sewerage, size and form of sewers, cost and methods of construction.

Texts: { *Folwell*:—"Sewerage."  
          { *Kinnicutt, Winslow and Pratt*:—"Sewage Disposal."

**163—Sewer Design.**

*Fourth Year, Civil Engineering, Second Semester, Three Hours  
per Week.*

This course runs concurrently with No. 151 and No. 162. It is devoted to the design of a part of a sewerage system for a city and includes, general plan, profiles, design of outfall, laterals, and appurtenances.

**173—Structures II.**

*Fourth Year, Civil Engineering, First Semester, Two Hours  
per Week*

This is a continuation of course No. 105 and is devoted to the computation and design of structures of wood and steel. The subjects treated are plate-girders and various roof and bridge trusses.

Text—*Spofford*:—"Theory of Structures."

**174—Reinforced Concrete.**

*Fourth Year, Civil Engineering, First Semester, Two Hours  
per Week.*

This course includes a study of the reinforced concrete beam, the design of slabs, T beams, columns, footings, reinforced concrete retaining walls and dams.

Text—*Hool*:—"Reinforced Concrete Construction,"  
Vol. I.

**175—Structures III.**

*Fourth Year, Civil Engineering, Second Semester, Three Hours  
per Week.*

A continuation of course No. 173, including the study of portal bracing, viaduct towers, cantilever bridges, three hinged arches, columns, pin and riveted joints etc. The graphical and analytical methods are both used and the student is continually referred to contemporary technical journals for examples of actual practice.

Text—*Spofford*:—"Theory of Structures."

**176—Structural Design I.**

*Fourth Year, Civil Engineering, First Semester, Nine Hours  
per week.*

A drafting room course of three periods per week in which the student applies the principles studied in course No. 173 to problems in design. Each student is assigned a different problem and his work criticised as it progresses.

**177—Structural Design II.**

*Fourth Year, Civil Engineering, Second Semester, Fifteen Weeks, Nine Hours per Week.*

A continuation of course 176. The work covered in the two courses usually consists of the design of a wooden truss, a plate girder, a riveted or pin-connected truss and a design in reinforced concrete.

**201-202—Electrical Machinery.** (See p. 52)

**250-251—Electrical Engineering Laboratory.** (See p. 55)

**300—Steam Engines.** (See p. 58)

**301—Theory of Engines.** (See p. 59)

**350—Mechanical Engineering Laboratory.** (See p. 61)

**409—Engineering Geology.** (See p. 79)

**428—Metallurgy of Iron and Steel.** (See p. 71)

**500-501-502-503—Military Training.**

*Third and Fourth Years, Civil Electrical, Mechanical and Mining Engineering, First and Second Semesters, Two Hours per Week.*

According to the terms of the gift of the site upon which the Technical College is built from the Département of Militia and Defence, the College contracted to require specific military training as part of the course of every student studying for a degree. Before the recent war the instruction in this subject took the form of military science and drill. During the war almost all the students enlisted voluntarily in different branches of military service and besides the district headquarters of the Dep-

artment of Militia and Defence could not spare instructors from regular duties to lecture and drill the handful of students at the College.

In revising the course of military training it was thought best to plan it so that some definite goal could be achieved and a specific military status achieved by the successful student. Hence it was decided to organize a company of the Canadian Officers Training Corps to be known as the Technical College Contingent Officers Training Corps.

The course of instruction consists of two divisions (1) Parades and (2) Musketry.

The candidate is required to attend 40 instructional parades of 45 minutes each per year and to qualify in the annual course of musketry. Any student who passes satisfactorily the required tests and examinations for two years will secure certificate "A" which entitles him to qualify for a commission as Lieutenant (Infantry) in the Active Militia. If he subsequently applies for a commission in the Special Reserve of Officers of the British Army or in the Territorial Force, he will be granted the same privileges as a candidate who has gained a similar certificate in the Officers Training Corps in the United Kingdom provided that it is his bona fide intention to fulfill all the liabilities of an officer of the force he wishes to join.

Students who have undergone equivalent training or those who are medically unfit for the O. T. C. training and wish to be exempted from this part of the College courses must present their credentials or medical certificate for action of the Committee of Military Education at the beginning of the College year.

Details of the conditions regulating the contingent of the O. T. C. which affect the College students and

rules applying to examinations for certificate "A" are given in the following paragraphs:

**Members**—The C. O. T. C. forms no part of the organization for war and will not be called out for active service as a corps. In case of a "levee en masse," its members are liable to military service under the Militia Act in the same way as all other male inhabitants of Canada.

**Training**—The training of the C. O. T. C. is under the direction of the General Staff Officer of the District. Each unit will be trained by its own officers.

A parade will consist of not less than 45 minutes actual training or of two periods of not less than 30 minutes each.

**Corps Allowances and Grants**—A yearly capitation grant of \$500 will be paid to the Military Committee of the University for every member qualified as "efficient."

A grant of \$100 will be paid to the Military Committee of the University for each member on first joining the C. O. T. C. to provide for the first fitting of uniforms.

Each member who secures the proficiency certificate "A" will be paid \$5.00.

**Uniform, Arms, Equipment and Books**—Uniform will be supplied at the public expense to each officer and member of the C. O. T. C. on the following scales and conditions, viz:—

**Table No. 1—Uniform.**

Trousers, serge, drab	1	every	3	years
Shirts, service	1	"	3	"

Trousers, service	1	every	3	years.
Cap, forage, drab	1	"	"	"
Jackets, serge, drab	1	"	3	"
Greatcoat, drab	1	"	9	"
Puttees, drab	1	pair	"	3

The following arms and accoutrements will be supplied for each officer and member of the C. O. T. C.

Rifles, Ross, long  
 Bayonet, Ross  
 Scabbard, Ross  
 Complete set of equipment D. S. pattern, 1916.  
 Bottles, water  
 Carrier, water bottle  
 Covers, mess tin  
 Haversack  
 Kit bag  
 Mess tin  
 Sling, rifle

On each of the above articles of accoutrements and arms will be issued for use and will remain the property of the Militia Department.

It is expected that this equipment will be kept in good condition by the users, but repairs and replacements due to unavoidable damage and to fair wear and tear, will be carried out at public expense.

A free issue of books (Regulations, Training Manuals, etc.) will be made.

**Examinations for Certificate "A".**—The examinations will be partly written and partly oral.

**Standard**—The standard required is that of the commander of a platoon in an infantry company.

Such units cannot be considered apart from larger ones.

The larger units are made up of a combination of smaller ones, and intelligent co-operation depends on whether the leaders of the smaller understand the working of the larger.

E. g., the commander of a platoon of infantry must have—

A clear idea of what is required of a platoon from the point of view of the commander of a company, and understand the interior working of a platoon.

In addition, he must know what is required of the soldier as an individual, and as one of a combination.

Further, he should have general knowledge of the working of a battalion, some idea of what the other arms are, what they do and how they do it.

## PART I.—WRITTEN EXAMINATION.

There will be two papers.

The questions set are based on incidents which have occurred, or are likely to occur, in war. The system followed is to take a large force, to consider its action as a whole, and then to work down step by step until the sphere of action supposed to be that of the candidate is reached. A wide choice of possible situations is thus presented, and from these one is chosen. This is considered from various points of view, the factors which would affect the candidate are gone into, and the question framed accordingly.

In the report on the examination each question is discussed, and the influences which have a bearing on the

solution are dealt with in broad outline, those more directly affecting the candidate being examined in detail. Every candidate should study the report.

1st Paper—200 marks—2 hours. 1st day.

The object of this paper is to test whether candidates have such a knowledge of the action of the other arms as would be necessary for the efficient performance of their work as section commanders in the field.

Candidates are recommended to study Field Service Regulations, Part 1, Operations, Chapters 1 to VII and IX.

Chapter I.—Very generally. A candidate should know so much about the other branches as will be of direct use to him as a section commander.

For instance he should know how a cavalry soldier is armed and what the small bodies (troops, etc.), which may possibly be met with by an infantry patrol, do.

He should be aware of how artillery fire is directed, so that his formations may be modified accordingly.

Chapter II.—Preparation and despatch of such messages as a company commander might send or receive.

Operation, standing, and routine orders as they affect a company.

Chapter III.—Sections 24 to 33.

Chapter IV.—As it affects a platoon commander.

For example, Section 51. Allotment of Billets.

A platoon commander may be almost certain that he will not have to select billets himself; that will be done

by higher authority his battalion being allotted a specified quarter in which his company will be disposed by the battalion authorities.

He may expect to find his company in the houses on both sides of a street, or perhaps all in a big barn, and the men of his platoon distributed among five or six householders, and so on.

#### Chapter V.

Chapter VI.—90. Disposal of inhabitants and of the information they give.

#### Chapter VII.

Chapter IX.—129, 132, 133, 138.

2nd Paper.—200 marks—2 hours. 1st day.

The object of this paper is to test whether candidates have a good working knowledge of the duties of a platoon commander both regimental and in the field.

Candidates are recommended to read—  
Infantry Training, 1914.

Organization and Definitions.

Chapters I (less sections 47 to 74 inclusive), II, III, IV.

Lectures should be given on regimental duties as follows:

Discipline.....General instructions.  
Arrest and military custody.  
Investigation of charges.  
Summary and minor punishments.  
Drunkenness.

	Guard reports and Company conduct sheets.
	Disposal of prisoners awarded detention by C. O.
	Courts of inquiry, Committees and Boards.
Duties.....	Duties of a Subaltern.
	Responsibility for public money and stores.
	Organization of a Company.
	Roster of duties.
	Daily duties.
	Guards and piquets.
	Honours and salutes.
	Duties in aid of civil power.
Miscellaneous....	Enlistment.
	Conditions of service.
	Officers' and Sergeants' messes. (Their objects).
	Men's messing and cooking. (General system).
	System of keeping Company books, accounts, and returns.
	Dress of officers and men.
	Correspondence. (To write and address official letters).
	Pay and allowances of N. C. O's and men of a company.
	Method of supplying troops with food, forage, ammunition and stores in peace. (General knowledge).

## PART II.—ORAL EXAMINATION.

This examination is the complement of the written one, and is concerned with the practical details of the work of a platoon commander.

(a) 100 marks.

Squad and company drill.

The candidate should be able to move a company in close order and to correct any errors made by the commanders of sections and platoons.

He should be able to act as a section commander.

In squad drill he should be able to detect the mistakes of individuals and give detailed instruction as required.

(b) 150 marks.

The tactical handling of a platoon.

The candidate should be able to command a platoon as part of a company in attack and defence, and should have some idea of the mutual support which the fire of one section can afford to another.

The examiner will describe a situation involving the action of a company in attack or defence. He will indicate the relative positions of platoons and will then require the candidate to direct a platoon as part of that company.

Note.—It is to be borne in mind that advanced guards attack and that outposts defend, and candidates should be prepared for situations involving the action of companies engaged in either of these duties.

If a candidate is required to defend, a position will be pointed out to him, he will be told to occupy it and will then be given a succession of situations with which to deal.

Similarly, if required to attack he will be shown the objective, given the disposition of his men and of the rest of the imaginary company and then given a succession of situations.

That part of sub-head (c), Chapters III and IV, which relates to fire direction, control, etc., will be dealt with under this sub-head.

(c) 50 marks.

Musketry Regulations, Part 1, 1909, reprint 1914.

Chapter II, so far as it applies to the Ross rifle.

Chapter III, omitting Sections 23, 24, 29, 32, 33, 34, 35.

Chapter IV, omitting Sections 62, 63, 64.

Chapter V, omitting Sections 70, 71.

Rifle and Musketry Exercises for the Ross Rifle.

A member is expected to be familiar with the rifle as a weapon, not as a piece of complicated mechanism. He should be able to use it, and should be aware of the limitations to its effective use.

A detailed knowledge of the mechanism is not required; questions as to the length of bore, number of grooves, etc., will not be asked.

### **Course of Musketry.**

1. The Syllabus of Musketry Instruction to be carried out by the Canadian Officers Training Corps will be as follows:—

#### **Care of Arms—**

Musketry Regulations 1909 (reprint 1914) Part I, Paras. 84—118, with such variations in instructions as are necessitated by the details of construction of the Ross Rifle.

#### **Rifle Exercises—**

Rifle and Musketry Exercises for the Ross Rifle—Sections 1-35 inclusive.

## Musketry Exercises—

Musketry Regulations 1909 (reprint 1914) Part 1,  
Paras. 146-239, 267-292, 301-321.

## Musketry Practice—

As in Tables C and D below.

The work covered by Musketry Regulations, paras. 146-197, 301-321, need not be taken up during the recruit year.

2. Members will not be permitted to commence rifle practice until they are sufficiently familiar with the rifle and are proficient in aiming. They should be given practice on a miniature range, and on a service range before firing the classification practices, as in Table C.

3. No member will be considered efficient unless he has fired the annual course, as in Table C, or the miniature course as in Table D if a service range is not available.

4. In addition to the practices in Tables C and D extra ammunition is allowed for voluntary practice.

5. Applications for the use of targets on Government ranges will be made to the District Commander in sufficient time to permit of the issue of the necessary orders.

6. Attention is drawn to the following paragraphs of these regulations—

37. Training.

41. Musketry Course.

48. Conditions of Efficiency.

61. Allowance for transportation and markers.

Table 2, page 11. Musketry Badges.

76. Ammunition.

75. Musketry Equipment.

84. Annual Returns.

TABLE "C"—SERVICE RANGE.

No. of Practice	Description of Practice	Class of Target	Distance in Yards	No of Rounds	Instructions for Conduct of Practice
1	Independent	3rd Class	100	7	Lying
2	do.	do.	200	7	do.
3	do.	2nd Class	400	7	do.
4	do.	do.	500	7	do.
5	Snap shooting	Kneeling Figure No. 3	100	7	Target exposed 4 seconds
6	do.	Crossing Figure No. 6	200	7	The Target will be exposed and moved in quick time along a front of 30 feet and disappear.

(a) The rifles should be carefully sighted at each range by good shots.

(b) In practices 1, 2, 3, and 4, one sighting shot will be allowed.

(c) In practices 5 and 6 one round will be fired at each exposure. Every hit will be signalled and the shot hole indicated by a spotting disc. The position to be lying and, where available, cover consisting of sand bags of other devices used. Each hit in these practices to count three points.

(d) The system of target divisions and marking values for the first four practices will be in accordance with Regulations for Rifle Associations.

	2nd Class	3rd Class	
Bulls eye . . . . .	Diameter 6 inches	20 inches	5 points
Inner . . . . .	Diameter 15 inches	32 inches	4 points
Magpie . . . . .	Diameter 24 inches	48 inches	3 points
Outer . . . . .	Diameter 48 inches	72 inches	2 points

(e) For practices 5 and 6 the figure targets will be as laid down in Musketry Regulations, 1910, Part II and as issued from Ordnance Stores. (If these are not available, those described in Musketry Regulations 1905 may be used).

(f) Classification—

Those who obtain 110 points or over . . . . . 1st Class  
 Those who obtain 90 points, and under 110 . . . . . 2nd Class  
 Those who obtain less than 90 points . . . . . 3rd Class

TABLE "D"—MINIATURE RANGE.

Practice No.	Range.	Target.	No. of Rounds.	Conditions
1	25 yds.	No. 1	7	Position, lying.
2	do.	do.	7	do. kneeling.
3	do.	do.	7	do. lying 20 seconds for each shot.
4	do.	do.	7	do. kneeling. 20 sec- onds for each shot
5	do.	do.	7	do. lying. 7 shots in 1 minute.
6	do.	do.	7	do. kneeling. 7 shots in 1 minute.

(a) One sighting shot will be allowed before each practice.

(b) The target divisions and marking values will be as for Canadian Rifle League Target No. 1.

Bulls eye.....	1 in. diameter	5 points
Inner.....	2 in. diameter	4 points
Magpie.....	4 in. diameter	3 points
Outer.....	5 in. diameter	2 points

These targets may be purchased from Mr. R. J. Taylor, Queen Street, Ottawa, at a price of \$1.50 per thousand, plus postage or express.

(c) Classification—

Those who obtain 130 points or over.....1st Class shot

Those who obtain 100 points and under

130.....2nd Class shot....

Those who obtain under 100 points.....3rd Class shot

### 600—Technical Writing.

*Third Year, Civil, Electrical, Mechanical, and Mining Engineering, Second Semester, Two Hours per Week.*

The aim of this course is to train the engineering student in the special application of English composition to such demands as will be most frequently made upon him in practical life.

He is supposed to be familiar with the rules and practice of general composition and to be acquainted with some portion of good English literature. In this course the main stress will be laid upon the proper preparation of technical reports, articles for technical magazines, specifications, papers for professional societies, patent specifications, and other such literary efforts as frequently fall to the lot of the professional engineer.

Text—*Sypherd*—"Handbook of English for Engineers."

**601—Contracts and Specifications.**

*Fourth Year, Civil, Electrical, Mechanical, and Mining Engineering, Second Semester, One Hour per Week.*

This course covers the general subjects of preparing specifications and the law of contracts. It is taught in lectures by prominent jurists of the province, and aims to acquaint the student with the fundamentals of the Law of Contracts, especially those portions of the common law that should be familiar to the practicing engineer. References are given to standard authorities by the lecturer.

**602-603—Social and Industrial Economics.**

*Fourth Year, Civil, Electrical, Mechanical Engineering, First and Second Semesters, Two Hours per Week.*

The rapid spread of various theories of political economy and the new emphasis that has recently been placed on many revolutionary ideas, make it necessary for the young engineering graduate to have a knowledge of economics which will form a basis of opinion and action in practical life. The attempt will be made to give the student a broad view of modern political economy without delving into its historical development or stressing too much some recent crudescences that time has not levelled to their proper relative importance. In addition to political economy, special lectures will be given in scientific management, industrial relations, representation of labor in management, engineering salesmanship, corporation accounting, analysis of financial statements, etc.

Early stages of industrial development, industrial evolution in England and North America, utilities and goods, law of diminishing utility, demand, economy of spending and saving.

Evolution of methods of production, factors of production, saving and capital formation, production and sacrifice, cost of production and expense of production separation in ownership and organization of factors, the entrepreneur, division of labor, effect of subdivision of labor on worker, nature of business units, the corporation charter, corporation managements, advantages and social aspects of corporations, trusts and monopolies, methods of regulation and control.

Socialism, distributive justice, varieties of socialism, communism, Bolshevism, socialism and extension of existing institutions, strength and weakness of socialism, social reform, socialist movement, anarchism, ethical and social aspects of the living wage.

Transfers of goods: value, money, credit and banking, international trade, trade balances and exchange.

Distribution:—rent, wages and the labor problem, industrial efficiency, piece wages, profit sharing, democratic organization of industrial management scientific management, time study, workmens' compensation, insurance, social engineering, welfare work, industrial relations, employment management, housing, trade unionism, vocational education, interest, profits.

Public and corporation finance:—revenue, taxes, tariffs and drawbacks, corporation accounting, analysis of financial reports.

Text—*Ely*—Outlines of Economics.

**DEPARTMENT OF ELECTRICAL ENGINEERING.**

As announced elsewhere, the first two years of this course are given in the affiliated colleges. The course as herein described covers the third and fourth years. The plan is to give a broad and thorough training in the theory and practice of applied electricity together with that portion of its closely allied subject, steam and machine design. Greater stress is laid on thorough knowledge of the more elementary subjects than on the advanced theoretical side of the subject but as much of the latter is included as can be given in the time available.

The laboratories are exceptionally well supplied with engineering instruments suited to the work to be done throughout the course. It is to be noted further that these instruments are all accurate, high-grade, and reliable, the product of the best makers in America and Europe. They are intended for thoughtful and intelligent use and due care must be used at all times in handling them. Students are held strictly accountable for injury resulting from rough or careless manipulation and are not entrusted with the finer apparatus until they have shown proper skill and pains in manipulation and adjustment. The laboratories are located in the main building and in the engineering laboratories building, and are fully described, pp. 20-22.

Students taking this course should have a sound working knowledge of mathematics, physics, elementary chemistry, and mechanics. The theoretical work runs parallel with the laboratory work, extending thru the third and fourth years. The laboratory work is carried on with the purpose of developing quick and keen observations, the ability to observe and interpret data logically, quick, and skilful manipulation of instruments, manual dexterity, and the careful and intelligent handling of expensive and easily-injured

machines. Neatly and legibly written reports are required accompanied by sketches, log-sheets, and performance curves when needed, and the use of good English is insisted upon.

### **201-202—Electrical Machinery.**

*Third Year, Electrical, Mechanical, and Civil Engineering  
and Fourth Year Mining Engineering, First and Second  
Semester, Three Hours per Week.*

This is a course of three lectures per week and is designed to give the student a thorough knowledge of the principles underlying the study of Electrical Engineering. A study is made of the flow of currents; the laws of electro-magnetism and of the magnetic circuit current; the theory and operating characteristics of direct current machinery and the underlying principles of the operation of alternating current machinery.

Text—*Gray*—"Principles and Practice of Electrical Engineering."

### **203—204—Alternating Currents and Machinery.**

*Fourth Year, Electrical Engineering, First and Second Semester, Three Hours per Week.*

This course is a continuation of Nos. 201-202 and deals at length with the theory of alternating current circuits and their representation by vector diagrams and vector equations; the theory and operating characteristics of alternating-current machinery.

Text—*Christie*—"Electrical Engineering."

**209—Electrical Power Plant Engineering.**

*Fourth Year, Electrical and Mechanical Engineering, Second Semester, Three Hours per Week.*

This course deals with the construction and design of electric power plants and the economical selection and arrangement of machinery and auxiliary apparatus.

Text—*Weingreen*—"Electric Power Plant Engineering."

**211-A—Electric Railways.**

*Fourth Year, Electrical Engineering, Second Semester, First Eight Weeks, Two Hours per Week.*

This course takes up urban, inter-urban, and main line electrification; choice of systems; calculation of motor rating and car equipment; methods of control; braking and regeneration; storage batteries and boosters; general considerations.

Text—*Sheldon and Hausmann*—"Electric Traction and Transmission Engineering."

**211-B—Electrical Transmission.**

*Fourth Year, Electrical Engineering, Second Semester, Last Seven Weeks, Two Hours per Week.*

This course deals with the design and construction of Transmission and distribution lines. A study is made of the methods of calculating the electrical characteristics of long and short transmission lines as well as the calculations of mechanical stresses and strains.

Text—*Still*—"Electric Power Transmission."

**214—Electrical Illumination and Photometry.**

*Fourth Year, Electrical Engineering, First Semester, One Hour per Week.*

In this course a study is made of the various methods of illumination both interior and exterior. Special emphasis is laid upon the principles governing the design of a well planned lighting system.

Text—*Wickenden*—"Illumination & Photometry."

**212-213—Electrical Machine Design.**

*Fourth Year Electrical Engineering, First and Second Semester; One Three-Hour Period per Week. (One-Hour Period per Week Lecture in Addition During First Semester.)*

This course deals with the electrical design of direct and alternating current machinery and consists of practical problems in design. Special attention is paid to the limitations of different types of machines and to the preparation of specifications. During the first semester one hour period per week is devoted to lectures in addition to the three hour period devoted to problems and drafting.

Text—*Gray*—"Electrical Machine Design."

**215—Storage Battery Engineering.**

*Fourth Year, Electrical Engineering, First Semester, Two Hours per Week.*

A detailed study is made of the chemical action, operating characteristics, the field of application and the care and treatment of storage batteries.

Text—*Lyndon*—"Storage Battery Engineering."

**250-251—Electrical Engineering Laboratory.**

*Third Year Electrical, Mechanical and Civil Engineering  
and Fourth Year Mining Engineering, First and  
Second Semesters, One Three-Hour Period  
per Week.*

This course consists of a series of experiments to accompany course No. 201-202. Its purpose is to illustrate the fundamental principles and to give the student practice in operating and testing electrical machinery.

Text—*Karapetoff*—"Laboratory Manual."

**252-253—Electrical Engineering Laboratory.**

*Fourth Year, Electrical Engineering, First and Second Semester,  
Two Three-Hour Periods per Week.*

A continuation of course No. 250-251 dealing with testing of electrical machinery more especially alternating current machinery. Opportunities for special investigations will be afforded to fourth year students. Studies will be made of alternators, synchronous motors, induction motors, rotary converters, and transformers.

Text—*Karapetoff*—"Experimental Electrical Engineering."

**101—Mechanics of Engineering I,** (See p. 26.)

**102—Mechanics of Engineering II,** (See p. 26.)

**103—Materials Testing,** (See p. 26.)

**106—Structures IA,** (See p. 27.)

**111—Theoretical Hydraulics,** (See p. 27.)

- 112—Hydraulic Laboratory, (See p. 28.)
- 153—Hydraulic Engineering, (See p. 32.)
- 300—Steam Engines, Turbines and Boilers,  
(See p. 58.)
- 302—Thermodynamics, (See p. 59.)
- 301—Theory of Engines, (See p. 59.)
- 303—Steam Power Plants, (See p. 59.)
- 329B—330B—Machine Design Theory, (See p. 63.)
- 331—332—Machine Design and Drawing,  
(See p. 65.)
- 340-341-342-343—Machine Shop Practice,  
(See p. 64.)
- 350-351—Mechanical Engineering Laboratory,  
(See p. 61.)
- 428—Metallurgy of Iron and Steel, (See p. 71.)
- 500-501-502-503—Military Training, (See p. 35.)
- 600—Technical Writing, (See p. 48.)
- 601—Contracts and Specifications, (See p. 49.)
- 602-603—Social and Industrial Economics,  
(See p. 49.)

## DEPARTMENT OF MECHANICAL ENGINEERING

The purpose of this course in Mechanical Engineering is to impart a thorough knowledge of the basic principles of the design, construction, manufacture, and operation of machinery as used in manufacturing industries, power plants, and power transmission, as well as a general idea of the problems to be encountered in the executive and business management of the industries common to all modern civilization. Students who take this course should not only have a thorough elementary training in mathematics, physics, and shopwork, but should have in addition a natural aptitude for machinery, engines, power and hand tools; and no dislike for long hours, hard physical and mental work, and the greasy clothes of a working man.

Any men who can enter this course, after several years' actual experience in machine-shop or power-plant will be the better fitted for it, but for those who have been unable to receive this shop training there is a very modern machine-shop equipment in which the Mechanical Engineering students will have special training in both their third and fourth years thus making these men more fitted for their work on their graduation. The demands for such trained men are more than the colleges can supply.

All mechanical engineers require a good general knowledge of applied electricity, and all electrical engineers require thorough training in mechanical principles. Therefore the two courses are similar throughout and identical in the third year. In the fourth year the student drops the more advanced electrical work

and goes deeper into the study of the design and performance of machinery, steam and gas engines, and turbines. The mechanical laboratories are designed and equipped to give the student the necessary practice in the handling and testing of machinery in general, and of motive power units particularly. The equipment is complete and modern, and well adapted to illustrate the principles of the course as given in the class-room.

It is not intended to make an expert draughtsman out of every student taking this course; nevertheless, a great deal of work must be done on the drawing-board as it is today absolutely essential that all work shall be completely planned before undertaking any construction. Hence the course includes not only sketching and drawing of machines and their details, but a great deal of graphical and diagrammatic work, rational and empirical designs, and applied kinematics. Those men who enter with a defective knowledge of kinematics will be given a thorough review of the subject, as it is most essential to all engineering work involving valve-gears, cams, linkages, governors, etc.

### **300—Steam Engines, Turbines, and Boilers.**

*Third Year, Civil, Mechanical and Electrical Engineering,  
Mechanical Electrical and Mining Engineering, First  
Semester, Four Hours per Week.*

This course deals with fuel and combustion, furnaces, boilers, and steam production; the steam engine, the indicator and engine economy; steam turbines; condensers and auxilliary machinery. Running parallel with it is the laboratory course in Engine and Boiler testing.

- References: { *Ennis*:—"Applied Thermo Dynamics  
for Engineers."  
*Geberhardt*:—"Steam Power Plant  
Engineering."  
*Benjamin*:—"Heat and Steam."  
*French*:—"The Steam Turbine."  
*Hutton*:—"Steam Engines."  
*Moyer*:—"Steam Turbines."  
*Peabody*:—"Thermodynamics of Steam  
Engineering."  
*Shealey*:—"Steam Engines and Boilers."

### 301—Theory of Engines.

*Third Year, Civil, Mechanical, Electrical and Mining,  
Engineering, Third Semester, One Hour per Week.*

### 302—Thermodynamics.

*Third Year, Civil, Mining, Mechanical and Electrical  
Engineering, Semester, Four Hours per Week.*

This course in heat is considered one of the fundamentals of engineering and great stress is laid on the thorough mastery of its laws.

The elementary principles of heat and its effect are studied; the general laws of thermodynamics; theoretical heat engines, isothermal and adiabatic expansion; the application of the laws to the steam and other engines; the principles governing the transfer of heat from gases to water.

References:—The same as for No. 300.

### 303.—Steam Power Plants.

*Fourth Year, Mechanical and Electrical Engineering, First  
Semester, Three Hours per Week.*

A general study of choice of types in power station equipment; the economics of efficiency vs. cost; fixed

and operating charges; local conditions relative to each case which govern in choice of machinery; the cost of power; the laying out of power plants under assumed working conditions; design, preparation of bill of material, estimating the first cost; the influence of the cost of raw material, fuel, water, labor, and load factor, on the design; preparation of contract and specification.

Text—*Meyer*:—"Steam Power Plants."

References: { *Geberhardt*:—"Steam Power Plant Engineering."  
*Morrison*:—"Oil Engines."  
*Carpenter and Diedrichs*:—"Gas Engine."  
*Morris*:—"Steam Power Plant Piping."

### 305—Steam Turbines.

*Fourth Year, Second Semester, Mechanical Engineering, Two Hours per Week.*

A study of the types of turbines and the theory of their performance, the flow of steam and its action on the curved surface of the buckets, efficiency of turbines and their utility in general as compared with other forms of steam engine.

Text—*Moyer*:—"Steam Turbines."

### 306—Gas Engines.

*Fourth Year, Mechanical Engineering, Second Semester, Three Hours per Week.*

Gas engine types and points to be considered in making selection, small gas and gasoline engines, stationary and marine larger producer gas engines, their

design and operation, including methods of starting and igniting and sources of trouble; gas producers, their design, operation and efficiency.

References:  $\left\{ \begin{array}{l} \text{Morrison:—"Oil Engines."} \\ \text{Lucke:—"Gas Engine Design."} \\ \text{Carpenter and Diedrichs:—"Gas Engines."} \\ \text{Jones:—"Gas Engine."} \\ \text{Robinson:—"Gas and Oil Engines."} \end{array} \right.$

### 307—Mechanical Engineering Abstracts.

*Fourth Year, Mechanical Engineering, First Semester, One Hour per Week.*

This is a course dealing with current engineering problems. Topics will be assigned and reports required based on discussions in current engineering magazines, which will be on file in the library of the college.

### 350-351.—Mechanical Engineering Laboratory.

*Third Year, Civil, Electrical, Mechanical, and Mining Engineering, First and Second Semester, One Hour Lecture and Three Hours Laboratory per Week.*

A course of testing indicators and gauges, steam and gas and gasoline engines; dynamometers and the measurement of power, pyrometers and the measurement of heat; calorimeters, for steam and gas; pumping machinery and hydraulic motors.

Reference:—*Carpenter:—"Mechanical Engineering Laboratory."*

*Fourth Year, Mechanical Engineering, First and Second Semester, Three Hour per Week.*

References; { *Carpenters*:—"Experimental Engineering."  
                   *Flather's*:—"Dynamometers and Measure  
   ments of Power."

*Fourth Year, Mechanical Engineering, First Semester,  
Three Hours per Week.*

References: { *Carpenter*:—"Heating and Ventilating."  
*Baldwin*:—"Heating and Ventilating."  
*Sturtevant*:—"Heating and Ventilating."

**329-330—Machine Design Theory.**

*Third Year, Electrical and Mechanical Engineering, First and Second Semester, Three Hours per Week.*

This course makes practical application of the laws of mechanics, physics, and kinematics to actual machine building. Designs of various machines will be considered and drawings made in the accompanying course of drawing.

References: { *Spooner*:—"Machine Design."  
*Unwin*:—"Machine Design."  
*Leutwiler*:—"Machine Design."

**331-332—Machine Design and Drawing.**

*Third Year, First and Second Semester, Mechanical Engineering, Six Hours per Week, Electrical Engineering, Three Hours per Week.*

Lettering of mechanical drawings, preparations of working drawings of simple machines; design of machine parts; tracing and blueprinting.

**329B-330B—Machine Design Theory.**

*Fourth Year, Mechanical and Electrical Engineering, First Semester, Two Hours per Week, Second Semester, Three Hours per Week.*

Continuation of course No. 330. Design of cams and gear teeth, details of standard machinery, belt and pulley transmission, pipes and pipe joints, and engine details.

Reference: { *Leutwiler*:—"Machine Design."  
*Spooner*:—"Machine Design."  
*Reid*:—"Machine Design."  
*Unwin*:—"Machine Design."  
*Anthony*:—"Essentials of Gearing."

**333—Machine Design and Drawing.**

*Fourth Year, Electrical and Mechanical Engineering, First Semester, Three Hours per Week.*

A continuation of course No.331-332, dealing with more difficult problems in the design of steam engines, gas engines and machine tools.

**334—Machine Design and Drawing.**

*Fourth Year, Mechanical Engineering, First Semester, Three Hours per Week.*

A course of problems as assigned in design along lines in which the student expects to specialize.

**340-341-342-343—Machine Shop Practise.**

*Third and Fourth Year, Electrical and Mechanical Engineering, First and Second Semester, Four Hours per Week.*

This course is intended to give the engineering student a practical knowledge of the construction and operation of modern machine tools, together with the laying out, manufacture, and assembly of machine parts.

Repair of equipment, construction of typical commercial jobs and tool making conducted by standard machine shop methods, will also be included in this course.

**336—Mechanical Design.**

*Fourth Year, Second Semester, Three Hours per Week.*

- 101—Mechanics of Engineering I. (See p. 26)
- 102—Mechanics of Engineering II. (See p. 26)
- 103—Materials Testing. (See p. 26)
- 105—Structures I. (See p. 27)
- 111—Theoretical Hydraulics. (See p. 27)
- 112—Hydraulic Laboratory. (See p. 28)
- 153—Hydraulic Engineering. (See p. 32)
- 201-202—Electrical Machinery. (See p. 52)
- 209—Electrical Distribution. (See p. 53)
- 250-251—Engineering Laboratory. (See p. 55)
- 428—Metallurgy of Iron and Steel. (See p. 71)
- 502-503—Military Training (See p. 35)
- 600—Technical, Writing. (See p. 48)
- 601—Contracts and Specifications. (See p. 49)
- 602-603—Social and Industrial Economics (See p. 49)

## DEPARTMENT OF MINING ENGINEERING.

### 403—Qualitative Analysis.

*Third Year, Mining Engineering, First Semester, One Hour per Week Lecture, Six Hours per week, Laboratory*

The lectures treat of the theory of qualitative analysis and the chemistry of the reactions involved in the laboratory work.

The laboratory work includes the practice of manipulation and the laboratory study of the bases and acids, their reactions and detection.

Text—*Bevins*:—"Qualitative Chemical Analysis."

Reference: *Smith*:—"General Chemistry for Colleges."

#### 404—Quantitative Analysis.

*Third Year, Mining Engineering, Second Semester, One Hour per Week Lecture, Nine Hours per Week Laboratory*

The aim of this course is to acquaint the student with the theory and practice of representative methods of gravimetric and volumetric quantitative analysis. A high standard of accuracy is required.

Reports must be written up to date and submitted to the instructor at the completion of each separate analysis. Each student is required to make a deposit to cover breakage.

The following analysis are included in the course and are supplemented with extra work according to the rapidity with which each individual works:

Determination of water, barium and chlorine in barium chloride; magnesia, sulphuric acid and water in potash alum; analysis of limestone; preparing normal solutions; analysis of acids and alkalis; temporary and permanent hardness of water; iron ores by the bichromate and permanganate methods; chlorine in bleaching powders; oxidizing power of pyrolusite; carbon, silicon, sulphur, manganese and phosphorus in steel or pig iron; copper, lead, and zinc in ores; proximate analysis, sulphur and calorific power of coal.

Texts { *Allan*:—"Quantitative Chemical Analysis."  
          *Aungst*:—"Technical Chemical Analysis."  
          *Lord and Demorest*:—"Metallurgical Analysis."

**405—Quantitative Analysis.**

*Third Year, Mining Engineering, First Semester, One Hour per Week.*

This is a course of lectures to accompany course No. 404. It covers the work done in the laboratory and includes discussions of quantitative separations from a theoretical standpoint, as well as chemical calculations and a short course in Elementary Physical Chemistry.

Text—*Talbot and Blanchard*:—"Electrolytic Dissociation Theory."

**406—Mineralogy.**

*Third Year, Mining Engineering, First Semester, Two Hours Lectures and Four Hours Laboratory per Week.*

This course includes descriptive and determinative mineralogy and a brief introduction to crystallography.

The time will be largely given to laboratory work in order to train the student to determine minerals accurately and rapidly by their physical and chemical properties, to make him thoroughly acquainted with the appearance, properties, uses and association of the more important ore making minerals.

This is followed by determinative mineralogy proper.

Texts { *Moses and Parsons*:—"Crystallography,  
Mineralogy, and Blow-Pipe Analysis."  
*Butler*:—"Hand-book of Minerals."

References. { *Brush and Penfield*:—"Manual of Determinative Mineralogy and Blow-pipe Analysis."  
*Dana*:—"Textbook of Mineralogy."

**425—Principles of Metallurgy.**

*Third Year, Mining Engineering, First Semester, Two Hours per Week.*

This course serves as an introduction to the metallurgy of non-ferrous metals and also to the course on the metallurgy of iron and steel.

The subjects treated include a study of metals and alloys, their physical properties and thermal analysis, fuels, slags, gas producers, furnaces, pyrometry, refractories and metallurgical products.

Text—*Fulton*:—"Principles of Metallurgy."

References: { *Hofman*:—"General Metallurgy."  
                  *Chauveult*:—"Chemical Arithmetic."

**420—Assaying.**

*Third Year, Mining Engineering, Second Semester, One Hour Lecture and Four Hours Laboratory per Week.*

The purpose of this course is to acquaint the student with the theory and practice of fire assaying, as carried out to-day. The training prepares the student for the course in metallurgical laboratory, where he is required to trace the ore values through the mill runs and metallurgical tests that make up the course. It also prepares him to quickly become an expert assayer after he leaves college, if he starts his engineering practice in such a position.

Lectures are given from time to time covering the following points: assay furnaces, tools, reagents, sampling, weighing, reduction and oxidation reactions, slag formation; the various methods of crucible fusion, scorification, cupellation, parting and special methods for special ores and metallurgical products.

Reports will be required weekly, and must be kept up to date, otherwise full value for the work cannot be obtained.

The following assays are required:—Reducing power silver ores by scorification and crucible assay, gold ores by pot and muffle furnace fusion, lead ores by crucible fusion, ores with metalics, special ores and metallurgical products.

A deposit of \$5.00 will be required to cover cost of crucibles etc. used.

Text—*Bugbee*:—"Notes on Assaying."

Reference: *Lodge*:—"Notes on Assaying."

#### **403—Metallurgical Laboratory.**

*Fourth Year, Mining Engineering, Second Semester, Three Hours Laboratory, per Week,*

This course in laboratory work accompanies the courses in Principles of Metallurgy, Metallurgy of Iron and Steel and Electro-metallurgy.

The following include some of the metallurgical tests performed:—

Pyrometry and calibration of pyrometers, microscopic metallography and thermal treatment of steel.

#### **454—Compressed Air Machinery.**

*Fourth Year, Mining Engineering, First Semester, Two Hours per Week.*

This course is intended to accompany the general course in mining. The subjects treated are briefly as follows:—

Wet and dry compressors, straight line and duplex, simple and compound compression, dealing with heat of compression, conveyance of compressed air, reheating, operating machinery using compressed air, valve details of various makes, indicator air-cards, duty and efficiency, receivers, various types of air drills, as Ingersoll, Rand, Sullivan, McKeirnan, Leyner, etc., electric drills, coal undercutting machines of puncher, disc, and chain types, tunneling machines, compressed air locomotives, compressed air auxiliary engines for hoisting, etc.

#### **428—Electrometallurgy.**

*Third Year, Second Semester, One Hour per Week.*

The course serves as an introduction to the study of electrometallurgy.

It includes the theory and application of the electric current to:- extraction of metals from ores by electrolysis and smelting, the refining of metals and the recovery of associated constituents, the production of steels and refractory alloys in the electric furnace.

The metals considered are:—copper, lead, iron, nickel, antimony, silver, gold, aluminum and zinc and the alloys of iron with silicon, chromium, tungsten, vanadium etc.

#### **428—Metallurgy of Iron and Steel.**

*Fourth Year, Civil Engineering, Mechanical Engineering and  
Third Year Electrical Engineering, First Semester,  
Two Hours per Week.*

This course covers the same subjects as are taken in course No. 427 but in an abridged form, the idea being to deal principally with the physical and chemical properties of iron and steel rather than with the metallurgical processes of manufacture.

The following are taken in detail,—The properties of steel, cast iron, and wrought iron as influenced by composition and mechanical treatment together with a brief account of the chief processes of manufacture.

### 428—Metallurgy of Iron & Steel.

*Third Year, Mining Engineering, Second Semester, Two Hours per Week.*

In this course the metallurgy of iron and steel as carried out to-day is dealt with thoroughly. Much stress is laid upon metallurgical and thermal chemistry as applied to the iron and steel industry.

*Pig Iron:*—Ores, fuels and fluxes, iron blast furnace and accessories, smelting practice, chemistry of smelting process, calculating blast furnace charge, comparison of processes of purification of pig iron.

*Wrought Iron and Crucible Steel:*—Different processes of making wrought iron, elimination of impurities. Process and plant for making crucible steel, chemistry of processes.

*Acid and Basic Bessemer Steel:*—Plant and modern practice of acid and basic processes, chemistry and thermal efficiency of converters, comparison of two processes.

*Acid and Basic Open-Hearth Steel:*—Open-hearth furnaces and accessories, acid and basic open-hearth practice. Special open-hearth processes, duplex process, chemistry and thermal efficiency of processes.

*Mechanical Treatment of Steel:*—Forging, rolling, stamping, drawing, etc. Rolling Mill practice, heating furnaces.

*Iron and Steel Foundry:*—Making of moulds, design of patterns, cupola furnaces, steel casting practice, malleable castings.

*Constitution of Iron and Steel*:—Solution theory as applied to metals and their alloys, freezing curves, Roozeboom diagram, micro-constituents of iron and steel, metallography of iron and steel, physical properties, effect of impurities on cast iron and steel.

*Heat Treatment of Steel*:—Annealing, hardening and tempering of steel, improper heat treatment, constituents of hardened and tempered steel.

*Special Alloy Steel*.

*Corrosion of Iron and Steel*.

Text—*Stoughton*:—"Metallurgy of Iron and Steel."

References { *Howe*:—"Iron, Steel and other Alloys."  
*Bullen*:—"Steel, and its Heat Treatment."

#### 405—Structural Geology.

*Third Year, Mining Engineering, Second Semester, Fifteen Weeks, Three Hours per Week.*

This course is taken in two lecture and one laboratory hours per week. A brief course is given in the microscopic study of rocks and rock minerals, but more stress is laid on the study of rocks by megascopic means. The laboratory hour is given to this work, for which a large collection of rock samples is provided. The lecture work covers the classification of rocks; rock structures such as joints, folds, fissures and faults; and the action of underground and surface waters on rocks. Particular attention is paid to the economic phases of these subjects. The lecture course closes with a brief description of the methods of making geological surveys of mining properties.

Text—*Pirsson*—Rocks and Rock Minerals.

References { *Farrel and Moses*—Practical Field Geology.  
*Hayes*—Handbook for Field Geologists.  
*Spurr*—Geology Applied to Mining.  
*Leith*—Structural Geology.

**407—Economic Geology.**

*Fourth Year, Mining Engineering, First Semester, Two  
Hours per Weeks.*

This course takes up a discussion of the theory of the origin of ore deposits, particularly those of the metallic minerals. Attention is drawn to the aid which an understanding of these principles may give in the prospecting, exploration, and development of mines. Detailed descriptions of some of the principal mineral deposits of Canada are given.

Text—*Emmons*—Principles of Economic Geology.

References { *Lindgren*—Mineral Deposits.  
*Kemp*—Ore Deposits of the United  
States and Canada.  
*Ries*—Economic Geology.  
Reports of the Geological Survey of Canada.

**408—Economic Geology.**

*Fourth Year, Mining Engineering, Second Semester, Two  
Hours per Week.*

This course is a continuation of that given in the first semester. It will deal with the non-metallic minerals, building stones and road materials, clay, lime, and cements, salt, gypsum, fertilisers and abrasives. Particular attention will be given to the geology of coal, oil, and gas and the course will include detailed descriptions of the coal fields of Nova Scotia.

*Text and References* are the same as for No. 407.

**453—Ore Dressing.**

*Fourth Year, Mining Engineering First Semester,  
Five hours per Week.*

This course is given in two lecture hours and one laboratory period of three hours per week. It aims to give the student a thorough knowledge of the principles and modern practice of ore dressing. The machines studied are crushers, breakers, rolls, stamps, ball and pebble mills, roller mills, screens, classifiers, jigs, concentrating tables, slime tables, flotation machines and magnetic separators. Tests will be made in small lots of ores in a laboratory equipped with laboratory size machines where each student will be required to control the operation of the machine.

Text—*Richards*—Textbook of Ore Dressing.

Reference: *Richards*—Ore Dressing.

**415—Mine Surveying and Mapping.**

*Third Year, Mining Engineering, First Semester, Fifteen  
Weeks, Four Hours per Week.*

This course consists of one lecture hour and one drafting room period of three hours per week. It aims to acquaint the student with the special adaptations of surveying instruments and practice to underground mining work.

The lectures describe instruments used, illumination, methods of measuring angles and distances, methods used in inclined deposits, use of auxiliary telescope, plumbing shafts, survey of bore holes, and construction of mine models.

Drafting room practice covers the taking and recording of notes, calculations, plotting from notes, construction of mine maps and sections, and problems of intersection of veins with the surface, with one another, and intersecting faults.

Text—*Durham*—"Mine Surveying."

### 426—Non-Ferrous Metallurgy.

*Fourth Year, Mining Engineering, First Semester,  
Three Hours per Week.*

This course takes up a study of the principles underlying the treatment of gold, silver, copper, lead and zinc ores and the application of these principles in modern metallurgical practice. The course also takes up the marketing of ores and the different products of the smelters.

*Gold*—This subject takes up a study of stamp milling and amalgamation.

*Silver*—Most of the time in this subject is given to a study of the cyanide treatment of silver ores with a brief treatment of the roasting of silver ores, pan amalgamation and teaching methods.

*Copper*—Lectures on the subject cover the roasting of copper ores, blast furnace and reverberatory smelting, slags, production of metallic copper from matte, and furnace and electrolytic refining of copper. Modern teaching methods applied to copper ores will also be studied.

*Lead*—The work on this subject covers the roasting of lead and silver-lead ores and their treatment in the furnace. The methods of refining and desilverising base bullion are described.

*Zinc*—The treatment of zinc ores in retorts and by leaching methods is briefly described.

Text—*Gowland*—Non-Ferrous Metallurgy.

References: { *McFarren*—Textbook of Cyanide Practice.  
*Hofman*—Metallurgy of Copper.  
*Hofman*—Metallurgy of Lead.  
*Ingalls*—Metallurgy and Properties of Zinc.

#### 455—Ore Dressing.

*Fourth Year, Mining Engineering, Second Semester,  
Six Hours per Week.*

This course is given in two lecture hours and a laboratory period of four hours per week, and is a continuation of that given in the first semester. It will take up a study of the combinations of the different machines, mill processes and management. This will be illustrated by descriptions of modern milling plants and processes. Attention will be given to the testing of an ore for a process and time in the laboratory will be spent on this work. The students will be required to make tests and report on a process for different ores. Some of the preliminary work may be done on the laboratory size testing machines but large mill runs will also be made with the larger machines in the mill in the Murray Mining Laboratory.

Text.—*Richards*—Textbook of Ore Dressing.

References: { *Richards*—Ore Dressing.  
*Wiard*—Theory of Ore Dressing.  
*Hoover*—Concentrating Ores by Flotation.

**460—Mill Construction.**

*Fourth Year, Mining Engineering, First Semester,  
Two Hours per Week.*

This course treats of the construction and equipment of mill, smelter, and mine buildings. It covers a great number of details which the student does not get in his other classes but which the mining engineer frequently needs.

Points to which attention is given are building foundations, cements and mortars, concrete work, masonry, timber framing, headframes, trusses and trestles, laying out building and machinery foundations, erection of buildings and machines and boilers, shafts, belts and pulleys, dams and retaining walls.

Text.—Mining Engineer's Handbook.

References: { *Hobart*—Millwrighting.  
                  *Kent*—Mechanical Engineer's Handbook.  
                  *Merriman*—American Civil Engineer's Hand-  
                                  book.  
                  *Ketchum*—Design of Mill Structures.

**461-462—Mine Plant Design.**

*Fourth Year, Mining Engineering, First Semester,  
Three Hours per Week and Second Semester,  
Six Hours per Week.*

This is a drafting room course to take up the design of subjects discussed in the Course No. 460. During the first semester the student is required to work out problems on the design of subjects discussed in the class room. During the second semester he is required to design some small plant, or portion of a small plant, to suit certain specified conditions. Working drawings of a

plant such as a stamp mill, concentration plant, skip, cage, ore bin, or headframe are to be made. These drawings are supplemented by bills of material and estimates.

#### **450—Mining Engineering Methods.**

*Third Year, Mining Engineering, Second Semester, One Hour per Week.*

This is a series of lectures describing in general terms the nature of prospecting, exploration, development and exploitation of mines and the methods of treating the ores won. Descriptions will be given of some of the large mines, mills and smelters and their equipment. The course will be illustrated by lantern slides and photographs. It is designed to give the student an idea of the varied engineering practices required by the mining and metallurgical industries, in order that he may better appreciate and co-relate the more specific and technical courses which he later receives.

#### **451—Mining Engineering Methods**

*Fourth Year, Mining Engineering, Second Semester, Seven Hours per Week.*

This is a course of lectures covering the development and exploitation of mines. The subjects discussed are, prospecting; diamond drilling and deep bore holes; methods of driving tunnels, drifts, cross-cuts and raises, and sinking shafts; breaking ore in stopes; supporting excavations; methods of opening up an ore body; open cut methods of mining; underground metal-mining methods; coal-mining methods; placer mining; hoisting; haulage; pumping; ventilation; lighting; sampling and valuation; and mine organization and accounts.

Daily problems are given in this course where ever possible. At other times students are required to write short essays describing work in which they have been employed, or mines and mining districts from articles published in the mining journals or proceedings of mining societies. Certain hours will be allotted for the reading, criticism and discussion of these essays.

Texts { *Peele*—Mining Engineers' Handbook.  
           { *Young*—Elements of Mining.

References: { *Donaldson*—Practical Shaft Sinking.  
                   { *Storms*—Timbering and Mining.  
                   { *Hughes*—Textbook in Coal Mining.  
                   { *International Text-book Co.*—Coal-Mining.  
                   { *Wallace*—Simple Mine Accounting.  
                   { *Rickard*—Sampling and Estimation of  
                       Ore in a Mine.  
                   { *Herzig*—Mine Sampling and Valuing.  
                   { *Brinsmeade*—Mining Without Timber.  
                   { *Hoover*—Principles of Mining.  
                   { *Finlay*—Cost of Mining.

#### 409—Engineering Geology.

*Fourth Year, Civil Engineering, First Semester, Two Hours  
 per Week.*

This is a simple course in general geology adapted to the needs of the civil engineering students. It includes the determination of the commonest rocks and minerals.

Text—*Ries*—Engineering Geology.

**101—Mechanics of Engineering I.,** (See p. 26.)

**102—Mechanics of Engineering II,** (See p. 26.)

- 103—Materials Testing,** (See p. 26).
- 106—Structures IA,** (See p. 27).
- 111—Theoretical Hydraulics,** (See p. 27.)
- 112—Hydraulic Laboratory,** (See p. 28.)
- 123—Summer School in Surveying.**
- 201-202—Electrical Machinery,** (See p. 32.)
- 250-251—Electrical Engineering Laboratory,**  
(See p. 55.)
- 300—Steam Engines, Turbines and Boilers,**  
(See p. 58.)
- 301—Theory of Engines,** (See p. 59.)
- 350-351—Mechanical Engineering Laboratory,**  
(See p. 61.)
- 500-501-502-503—Military Training,** (See p. 35.)
- 600—Technical Writing,** (See p. 48.)
- 601—Contracts and Specifications,** (See p. 49.)
- 602-603—Social and Industrial Economics,**  
(See p. 49.)

Third Year  
Engineering Camp. Three Weeks Field Practice. (No. 123).

CIVIL ENGINEERING.

First Semester

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites and Remarks
			Lectures or Class Room	Field, Laboratory, or Drafting	Page	Course	
Mechanics of Eng. I.....	Mechanics 1.....	15	5	.....	26	101	Third year entrance
Advanced Surveying I.....	Civil Eng. 1.....	15	1	3	28	119	Third year entrance
Railroad Engineering I.....	Civil Eng. 2.....	15	3	.....	29	121	Third Year Entrance
Highway Engineering.....	Civil Eng. 18.....	15	2	.....	30	131	Third Year Entrance
Materials Testing II.....	Civil Eng. 19.....	15	.....	3	30	132	Concurrent with No. 131
Electrical Machinery.....	Elec. Eng. 1.....	15	3	.....	52	201	Third Year Entrance
Electrical Eng. Lab.....	Elec. Eng. 2.....	15	.....	3	55	250	Concurrent with No. 201
Steam Eng., Turbines, etc.	Thermo 1-A.....	15	4	.....	58	300	Third Year Entrance
Theory of Engines.....	Thermo. 1 B.....	15	1	.....	59	301	Third Year Entrance
Mech. Eng. Laboratory....	Mech. Eng. 3.....	15	1	3	61	350	Third Year Entrance
Military Training.....	Mil. Train. 1.....	15	.....	2	35	500	Third Year Entrance

Second Semester

Third Year

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites and Remarks
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Mechanics of Eng. II.....	Mechanics 2.....	15	3	.....	26	102	Course No. 101
Materials Testing I.....	Mechanics 3.....	15	.....	3	26	103	Concurrent with No. 102
Structures I.....	Civil Eng. 3.....	15	2	.....	27	105	Course No. 101
Advanced Surveying II.....	Civil Eng. 4.....	15	2	3	28	120	Course No. 119
Railroad Engineering II.....	Civil Eng. 5.....	15	3	.....	29	122	Course No. 121
Electrical Machinery.....	Elec. Eng. 4.....	15	3	.....	53	202	Course No. 201
Elec. Eng. Laboratory....	Elec. Eng. 5.....	15	.....	3	55	251	Course No. 250
Mech. Eng. Laboratory....	Mech. Eng. 4.....	15	1	3	61	351	Course No. 350
Technical Writing.....	English 1.....	15	2	.....	46	600	Third Year Entrance
Military Training.....	Mil. Train. 2.....	15	.....	2	35	501	Third Year Entrance

**CIVIL ENGINEERING.**  
**Fourth Year**      **First Semester**  
**Engineering Camp. Three Weeks Field Practice. (No. 124).**

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites and Remarks
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Theoretical Hydraulics . . . .	Hydraulics 1 . . . .	15	3	.....	27	111	Courses No. 101, 102
Hydraulic Laboratory . . . .	Hydraulics 2 . . . .	15	.....	3	28	112	Concurrent with No. 111
Masonry and Foundations . . . .	Civil Eng. 20 . . . .	15	3	.....	31	141	Courses No. 101-102
Materials Testing III . . . .	Civil Eng. 21 . . . .	15	.....	3	31	142	Concurrent with No. 141
Structures II . . . . .	Civil Eng. 9 . . . .	15	2	.....	33	173	Course No. 105
Reinforced Concrete . . . .	Civil Eng. 22 . . . .	15	2	.....	34	174	Courses No. 101, 102
Structural Design I . . . . .	Civil Eng. 10 . . . .	15	.....	9	34	176	Courses No. 101, 102
Engineering Geology . . . . .	Mining Eng. . . . .	15	2	.....	79	409	Third Year Entrance
Social & Ind. Economics . . . .	Economics 1 . . . .	15	2	.....	49	602	Third Year Entrance
Metallurgy of Iron & Steel . . . .	Metallurgy 7 . . . .	15	2	.....	71	428	Third Year Entrance
Military Training . . . . .	Mil. Train. 3 . . . .	15	.....	2	35	502	Courses No. 500, 501

**Fourth Year**

**Second Semester**

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites and Remarks
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Masonry Design . . . . .	Civil Eng. 23 . . . .	15	.....	3	31	143	Course No. 141
Water Supply . . . . .	Civil Eng. 11 . . . .	15	3	.....	32	151	Courses No. 111, 112
Hydraulic Engineering . . . .	Hydraulics 3 . . . .	15	3	.....	32	153	Courses No. 111, 112
Hydraulic Design . . . . .	Civil Eng. 12 . . . .	15	.....	3	32	154	Concurrent with No. 153
Sew. and Sewage disposal . . . .	Civil Eng. 13 . . . .	15	3	.....	33	162	Courses No. 111, 112
Sewer Design . . . . .	Civil Eng. 14 . . . .	15	.....	3	33	163	Concurrent with No. 162
Structures III . . . . .	Civil Eng. 15 . . . .	15	3	.....	34	175	Course No. 173
Structural Design II . . . . .	Civil Eng. 16 . . . .	15	.....	9	35	177	Concurrent with No. 177
Contracts & Specifications . . . .	Contracts . . . . .	15	1	.....	49	601	Third Year Entrance
Social and Ind. Economics . . . .	Economics 2 . . . .	15	2	.....	49	603	Course No. 602
Military Training . . . . .	Mil. Train. 4 . . . .	15	.....	2	35	503	Courses No. 500, 501

Third Year                      MECHANICAL AND ELECTRICAL ENGINEERING                      First Semester

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Electric Machinery.....	Elec. Eng. 1.....	15	3	.....	52	201	Third Year Entrance
Elec. Eng. Lab.....	Elec. Eng. 2.....	15	.....	3	55	250	Third Year Entrance
Steam, Engines, Tur. etc..	Thermo 1-A.....	15	4	.....	58	300	Third Year Entrance
Theory of Engines.....	Thermo 1-B.....	15	1	.....	...	301A	Third Year Entrance
Mech. Eng. Lab.....	Mech. Eng. 3.....	15	.....	3	61	350	Concurrent with 301
Mech. Eng. I.....	Mechanics 1.....	15	5	.....	26	101	Third Year Entrance
Metallurgy of Iron & Steel.	Metallurgy 7.....	15	4	.....	71	428	Third Year Entrance
Mach. Design Theory.....	Mech. Eng. 1	15	3	.....	63	329	Third Year Entrance
" " Drawing.....	" 2	15	.....	6	63	331	For Mechanical Engines
" " Drawing.....	" 2A	15	.....	3	63	331A	For Electrical Engines
Mach. Shop Practice.....	" 20	15	.....	4	64	340	Third Year Entrance
Military Training.....	Military Train..	15	.....	2	35	500	Third Year Entrance



MECHANICAL AND ELECTRICAL ENGINEERING.

Fourth Year.

First Semester

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Mech. Design Theory.....	Mech. Eng. 7...	15	2	.....	63	329B	Course 330-332
Steam Power Plants.....	" 8...	15	3	.....	59	303	" 301-302
Theoretical Hydraulics.....	Hydraulics I....	15	3	.....	27	111	" 101-102
Hydraulic Lab.....	" II....	15	.....	3	28	112	Concurrent with 111
Machine Shop Practise.....	Mech. Eng. 22...	15	.....	4	64	342	Course 341
Military Training.....	Military Train. 3	15	.....	2	35	503	" 500-501
Social & Ind. Economics...	Economics I....	15	2	.....	49	602	Third Year Ent.
<b>Electrical Eng. Option</b>							
Alter. Current & Mach.....	Elec. Eng. 7....	15	3	...	32	203	Courses 202-251
Electrical Mach. Design...	" 17	15	1	3	54	212	" 202-330
Storage Battery Eng.....	Elect. Eng. 10	15	2	.....	54	215	" 202
Illumination & Photometry	" 22...	15	1	.....	84	214	" 202
Elec. Eng. Lab.....	" 8....	15	.....	6	55	252	" 251
<b>Mechanical Eng. Option</b>							
Mech. Eng. Lab.....	Mech. Eng. 6....	15	.....	3	56	352	" 351
Heating & Ventilating.....	" 12...	15	3	.....	62	322	" 301-303
Mach. Design & Drawing..	" 9....	15	.....	6	63	333	Course 332
Mech. Eng. Abstracts.....	" 13...	15	1	.....	61	307	Third Year Entrance



First Semester

MINING ENGINEERING.

Third Year

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Mech. of Engineering I....	Mechanics 1....	15	5	.....	26	101	Third Year Entrance
Electrical Machinery.....	Elec. Eng. 1....	15	3	.....	54	201	Third Year Entrance
Electrical Eng. Lab.....	Elec. Eng. 2....	15	.....	3	55	250	Concurrent with No. 201
Steam Engines, Turb etc..	Thermo 1-A....	15	4	.....	58	300	Third Year Entrance
Theory of Engineering.....	Thermo 1-A....	15	4	.....	59	301	Third Year Entrance
Mech. Eng. Laboratory....	Mech. Eng. 3....	15	.....	3	66	350	Concurrent with No. 340
Qualitative Analysis.....	Chemistry 3....	15	1	.....	65	403	Third Year Entrance
Mineralogy.....	Geology 2....	15	2	4	67	406	Third Year Entrance
Principles of Metallurgy...	Metallurgy 1....	15	2	.....	68	425	Third Year Entrance
Mine Sur. & Mapping.....	Min. Eng. 7....	15	1	3	94	415	Course No. 123
Military Training.....	Mil. Train. 1....	15	.....	2	35	500	Third Year Entrance

Third Year

Second Semester

SUBJECTS	Reference Title	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting	Page	Course	
Mech. of Eng II.....	Mechanics 2....	15	3	.....	26	102	Course No. 101
Materials Testing I.....	Mechanics 3....	15	.....	3	26	103	Concurrent with No. 102
Mech. Eng. Laboratory....	Civil Eng. 3-A..	15	2	.....	27	106	Course No. 101
Structures 1-A.....	Chemistry 4....	15	.....	9	66	404	Course No. 403
Quantitative Analysis.....	Chemistry 5....	15	1	.....	67	405	Course No. 403
Quantitative Analysis.....	Chemistry 3....	15	1	4	68	420	Third Year Entrance
Assaying.....	Metallurgy.....	15	1	.....	70	428	Third Year Entrance
Electrometallurgy.....	Metallurgy 3....	15	2	.....	70	427	Third Year Entrance
Met. of Iron and Steel....	Geology 3....	15	3	.....	72	405	Third Year Entrance
Structural Geology.....	Min. Eng. 10....	15	1	.....	78	450	Third Year Entrance
Mining Eng. Methods.....	English 1.....	15	2	.....	48	600	Third Year Entrance
Technical Writing.....	Mil. Train. 2....	15	.....	2	35	501	Third Year Entrance
Military Training.....		15	.....				

## First Semester

## MINING ENGINEERING.

## Fourth Year.

SUBJECTS	Reference Title	Weeks	Hours per Week			Page	Course	Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting				
Theoretical Hydraulics....	Hydraulics 1....	15	3	.....		27	111	Courses No. 101, 102
Hydraulic Laboratory....	Hydraulics 2....	15	.....	3		28	112	Concurrent with No. 111
Compressed Air Mach....	Min. Eng....	15	2	.....		69	454	Course No. 300
Economic Geology....	Geology 4....	15	2	.....		93	407	Courses No. 405, 406
Ore Dressing....	Metallurgy 8....	15	2	3		74	453	Course No. 450
Non-Ferrous Metallurgy...	Metallurgy 2....	15	3	.....		75	426	Course No. 425
Mill Construction....	Min. Eng. 3....	15	2	.....		77	460	Course No. 106
Mine Plant Design....	Min. Eng. 4....	15	.....	3		77	461	Courses No. 102, 103
Military Training....	Mil. Train 3....	15	.....	2		35	502	Courses No. 500, 501
Social & Ind. Economics...	Economics 1....	15	4	.....		49	602	Third Year Entrance

## Second Semester

## Fourth Year

SUBJECTS	Reference Title	Weeks	Hours per Week			Page	Course	Pre-Requisites, etc.
			Lectures or Class Room	Field, Laboratory or Drafting				
Metallurgical Laboratory...	Metallurgy 9....	15	.....	3		69	403	Courses No. 404, 405
Economic Geology....	Geology 5....	15	2	.....		73	408	Course No. 407
Ore Dressing....	Metallurgy 10....	15	2	4		76	455	Course No. 453
Mine Plant Design....	Min. Eng. 5....	15	.....	6		97	462	Course No. 461
Mining Eng. Methods....	Min. Eng. 11....	15	7	.....		78	451	Course No. 450
Con. and Specifications....	Contracts....	15	1	.....		49	601	Third Year Entrance
Military Training....	Mil. Train. 4....	15	.....	2		34	503	Courses No. 500, 501
Social & Ind. Economics...	Economics 2....	15	2	.....		49	603	Course No. 602

**Fourth Year** **MINING ENGINEERING.** **First Semester**  
**Summer School of Mining—Four to Six Weeks.**

SUBJECTS	Reference No.	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures, Class Room	Lab. or Drafting	Page	Course	
Hydraulics.....	Hydraulics 1.....	15	3	.....	27	111	101,102
Hydraulics Laboratory.....	Hydraulics 2.....	15	.....	3	28	112	101,102
Electrical Machinery.....	Elec. Eng. 1-A.....	15	3	.....	52	201A	Third Year Entrance
Elec. Eng. Laboratory.....	Elec. Eng. 2A.....	15	.....	3	55	250A	Third Year Entrance
Non-Ferrous Metallurgy.....	Metallurgy 2.....	15	3	.....	75	426	425
Ore Dressing.....	Metallurgy 5.....	15	2	.....	74	453	Third Year Entrance
Ore Dressing Laboratory.....	Metallurgy 6.....	15	.....	3	76	404	Third Year Entrance
Compressed Air Machinery.....	Mining 2.....	15	2	.....	77	454	450
Economic Geology.....	Geology 4.....	15	2	.....	73	407	405, 406
Mill Construction.....	Mining 3.....	15	2	.....	77	460	101, 102, 105
Mine Plant Design.....	Mining 4.....	15	.....	3	77	461	With 460
Economics.....	.....	15	2	.....	49	602	Third Year Entrance
Military Training.....	Mil. Train. 3.....	15	.....	2	35	502	Third Year Entrance

**Second Semester**

**Fourth Year**

SUBJECTS	Reference No.	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures, Class Room	Lab. or Drafting	Page	Course	
Electrical Machinery.....	Elec. Eng. 4A.....	15	3	.....	52	202	201A
Elec. Eng. Laboratory.....	Elec. Eng. 5A.....	15	.....	3	55	251A	250A
Mining Engineering.....	Mining.....	15	7	.....	78	451	450,454
Economic Geology.....	Geology 5.....	15	2	.....	73	408	407
Ore Dressing.....	Metallurgy 5.....	15	2	.....	75	453	453 of 1st term
Ore Dressing Laboratory.....	Metallurgy 6.....	15	.....	4	76	404	both terms
Metallurgical Laboratory.....	Metallurgy 4.....	15	.....	3	69	403	425, 427
Mine Plant Design.....	Mining 4.....	15	.....	6	77	461	same as first term
Economics.....	.....	15	2	.....	.....	603	Third Year Entrance
Contracts & Specifications.....	Contracts 1.....	15	1	.....	.....	601	Third Year Entrance
Military Training.....	Mil. Train. 4.....	15	.....	2	35	503	Third Year Entrance

## First Semester.

SUBJECTS	Reference No.	Weeks	Hours per Week		For details see		Pre-Requisites, etc.
			Lectures, Class Room	Lab. or Drafting	Page	Course	
Mechanics of Engineering I	Mechanics I . . . .	15	5	. . . . .	36	101	Third Year Entrance
Theory of Engines . . . . .	. . . . .	15	1	. . . . .	59	301	"
Thermodynamics . . . . .	Thermo 1-A . . . .	15	4	. . . . .	58	301-A	"
Mech. Engineering Lab. . . .	Mech. Eng. 3 . . . .	15	. . . . .	3	61	350	"
Qualitative Analysis . . . .	Chemistry 1 . . . .	15	1	. . . . .	65	400	"
Mineralogy . . . . .	Geology 2 . . . . .	15	2	4	67	406	"
Principles of Metallurgy . . .	Metallurgy 1 . . . .	15	2	. . . . .	68	425	"
Mine Sur. & Mapping . . . .	Mining 7 . . . . .	15	1	3	74	415	Engineering Camp
Military Training . . . . .	. . . . .	15	1	1	35	500	

### Third Year

SUBJECTS	Reference No.	Weeks	Hours per Week		For details see		Course No.	Pre-Requisites, etc.
			Lectures, Class Room	Lab. or Drafting	Page	Course		
Mech. of Engineering II. . . . .	Mechanics 2. . . . .	15	3	.....	26	102	101	
Structures 1A. . . . .	Civil Eng. 3-A. . . . .	15	2	.....	27	106	101	
Materials Testing . . . . .	Civil Eng. 3. . . . .	15	.....	3	26	103	101	
Quantitative Analysis. . . . .	Chemistry 2. . . . .	15	1	9	66	401,402	400	
Assaying. . . . .	Chemistry 3. . . . .	15	1	4	68	420	400	
Metallurgy of Iron & Steel . . . . .	Metallurgy 3. . . . .	15	2	.....	71	427	400,425	
Electrometallurgy . . . . .	Metallurgy 7. . . . .	.....	1	.....	70	428	425	
Structural Geology. . . . .	Geology 3. . . . .	15	2	1	72	405	406	
Mines and Mining. . . . .	Mining 1. . . . .	15	1	.....	78	450		
Technical Writing. . . . .	.....	15	2	.....	43	600		
Military Training. . . . .	Mil. Train. 2. . . . .	15	1	2	35	.....		Third Year Entrance

## CIVIL ENGINEERING—TIME TABLE.

## First Semester.

Hour	Year	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9—10	3	Mech. I	Mech. I	Mech. I	Mech. I	Mech. I	Ad. Survey
	4	Hydraulics	Mas.&Found	Hydraulics	Mas.&Found	Hydraulics	Mas.&Found
10—11	3	Elec. Mach.	Highways	Elec. Mach.	Highways	Elec. Mach.	Ad. Survey
	4	Struct. II	Rein. Conc.	Struct. II	Reinf. Conc.	Struct. II	
11—12	3	Theor. Engines	Thermo I-A	Thermo I-A	Thermo I-A	Thermo I-A	Ad. Survey
	4						
12—1	3	R. R. Eng. I	M. S. & P. T.	R. R. Eng. I	M. S. & P. T.	R. R. Eng. I	Ad. Survey
	4	Met. of Iron & S	Economics E. E. Lab.	Met. of Iron & S M. E. Lab.	Economics Mat. Test. I	Met. of I & S	
2—3	4	Str. Design I	Mat. Test. III	Str. Design I	Hyd. Lab.	Str. Design I	
	3		E. E. Lab.	M. E. Lab.	Mat. Test. I		
3—4	4	Str. Design I	Mat. Test. III	Str. Design I	Hyd. Lab.	Str. Design I	
	3		E. E. Lab.	M. E. Lab.	Mat. Test. I		
4—5	4	Str. Design I	Mat. Test. III	Str. Design I	Hyd. Lab.	Str. Design I	
	3		E. E. Lab.	M. E. Lab.	Mat. Test. I		
5—6	4	Str. Design I	Mat. Test. III	Str. Design I	Hyd. Lab.	Str. Design I	
	3 & 4		Mil. Train.		Mil. Train.		

**CIVIL ENGINEERING—TIME TABLE**  
**Second Semester.**

Hour	Year	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9—10	3	Mech. II	Eng. Geol.	Mech. II	Eng. Geol.	Mech. II	Ad. Survey
	4	Hyd. Eng. ....	Water Supply	Hyd. Eng.	Water Supply	Hyd. Eng.	Water Supply
10—11	3	Elec. Mach.	Struct. I	Elec. Mach.	Struct. I.	Elec. Mach.	Ad. Survey.
	4	Struct. III	Sew. & S. Dis.	Struct. III	Sew. & S. Dis.	Struct. III	Sewer Design
11—12	3	R. R. Eng. II	Ad. Survey.	R. R. Eng. II	Ad. Survey.	R. R. Eng. II	Ad. Survey.
	4	Sew. & S. Dis.					Sewer Design
12—1	3	Tech. Writing	M. S. & P. T.	Tech. Writing	M. S. & P. T.		
	4		Economics	Contracts	Economics		Sewer Design
2—3	3		E. E. Lab.	Mat. Test. II			
	4	Str. Design II	Mas. Design	Str. Design II	Hyd. Design	Str. Design II	
3—4	3		E. E. Lab.	Mat. Test. II			
	4	Str. Design II	Mas. Design	Str. Design II	Hyd. Design	Str. Design II	
4—5	3		E. E. Lab.	Mat. Test. II			
	4	Str. Design II	Mas. Design	Str. Design II	Hyd. Design	Str. Design II	
5—6	3 & 4		Mil. Training		Mil. Training		

MECHANICAL ENGINEERING—TIME TABLE.  
First Semester.

Time	Yr.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 to 10	3	Mechanics 1	Mechanics 1	Mechanics 1	Mechanics 1	Mechanics 1	Shop Practice
	4	Hydraulics	Mach. Design Theory	Hydraulics	Mach. Design Theory	Hydraulics	" "
10 to 11	3	Elec. Mach.	Mach. Design Theory	Elect. Mach.	Mach. Design Theory	Elect. Mach.	" "
	4	Steam Power Plants		Steam Power Plants		Steam Power Plants	" "
11 to 12	3	Theory of Engines	Thermo 1-A	Thermo 1-A	Thermo 1-A	Thermo 1-A	" "
	4	Engineering Abstracts					" "
12 to 1	3	Metallurgy of Iron & Steel	Military Sc. & phy. Train.	Metallurgy of Iron & Steel	Military Sc. & Physical Train.	Mach. Des. Theory	" "
	4	Heating and Ventilating	Economics	Heating & Ventilation	Economics	Heating & Ventilation	" "
Afternoon.							
2 to 5	3		Mech. Eng. Laboratory	Machine Des. & Drafting		Mach. Design	
	4	Mech. Eng. Lab.		Mach. Design.		Mach. Design	
6-5	3 & 4		Mil. Train.		Mil. Train.		

MECHANICAL ENGINEERING—TIME TABLE.  
Second Semester.

Time	Yr.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9 to 10	3	Mechanics II	Structures I	Mechanics II	Structures I	Mechanics II	Shop Practise
	4	Hydraulic Engineering		Hydraulic Engineering		Hydraulic Engineering	Shop Practise
10 to 11	3	Electric Machinery	Machine Design Theory	Electric Machinery	Machine Design Theory	Electric Machinery	Shop Practise
	4	Machine Design Theory	Gas Engines	Machine Design Theory	Gas Engines	Machine Design Theory	Shop Practise
11 to 12	3	Mech. Lab. Lecture	Thermo 2A	Thermo 2A	Thermo 2A	Thermo. 2A	Shop Practise
	4	Steam Turbines		Steam Turbines		Gas. Engines	Shop Practise
12 to 1	3	Technical Writing	Mil. Sc. & Phy. Train.	Technical Writing	Mil. Sc. & Phy. Train.		
	4		Economics	Contracts & Specifications	Economics		
Afternoon.							
2 to 5	3		Mech. Eng. Laboratory		Mach. Design	Machine Design	
	4	Mech. Eng. Laboratory				Mach Design	
5-6	3 & 4		Mil. Train.		Mil. Train.		

ELECTRICAL ENGINEERING—TIME TABLE.

First Semester.

Time	Yr.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
9 to 10	3	Mechanics I	Mechanics I	Mechanics I	Mechanics I	Mechanics I	Shop Practise
	4	Hydraulics	Mach. Design Theory	Hydraulics	Mach. Design Theory	Hydraulics	Shop Practise
10 to 11	3	Elec. Mach.	Mach. Design Theory	Elec. Mach.	Mach. Design Theory	Elec. Mach.	Shop Practise
	4	Steam Power Plants	Storage Batt. Engineering	Steam Power Plants	Storage Batt. Engineering	Steam Power Plants	Shop Practise
11 to	3	Theory of Eng.	Thermo 1-A	Thermo 1-A	Thermo 1-A	Thermo 1-A	Shop Practise
	4	Alternating Currents	Elec. Design Theory	Alternating Currents	Illumination & Photometry	Alternating Currents	Shop Practise
12 to 1	3	Metallurgy of Iron & Steel	Mil. Sc. of Phy. Train.	Metallurgy of Iron & Steel	Mil. Sc. and Phy. Train.	Mach. Design Theory	Shop Practise
	4		Economics		Economics		
2 to 5	3	Electrical Laboratory	Mech. Eng. Laboratory	Mach. Design			
	4	Elect. Design		Elec. Lab.	Hydraulic Laboratory	Electrical Laboratory	
5-6	3 & 4		Mil. Train.		Mil. Train.		

## ELECTRICAL ENGINEERING—TIME TABLE.

## Second Semester.

Time	Yr.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.
9 to 10	3	Mechanics II	Structures IA	Mechanics II	Structures 1A	Mechanics II	Shop Practise
	4	Hydraulic Engineering		Hydraulic Engineering		Hydraulic Engineering	Shop Practise
10 to 11	3	Elec. Mach.	Mach. Design Theory	Elec. Machy.	Mach. Design Theory	Elec. Machy.	Shop Practise
	4	Mach. Design Theory	Elect. Ry. 8 w. Elec. Tran. 7w	Mach. Design Theory	Elect. Rys. 8 w Elec. Tran. 7w	Mach. Design Theory	Shop Practise
11 to 12	3	Mech. Lab. Lecture	Thermo 2A	Thermo 2A	Thermo 2A	Thermo 2A	Shop Practise
	4	Alternating Currents	Elec. Power Plants	Alternating Currents	Elec. Power Plants	Alternating Currents	Shop Practise
12 to 1	3	Technical Writing	Military Sc. & P. T.	Technical Writing	Military Sc. & P. T.		
	4	Electric Power Plants	Economics	Contracts & Specifications	Economics		
2 to 5	3	Electrical Laboratory	Mech. Eng. Laboratory	Testing Materials	Machine Design		
	4	Elec. Mach. Design		Electrical Laboratory	Elec. Mach. Design	Electrical Laboratory	
5-6	3 & 4		Mil. Train.		Mil. Train.		

MINING ENGINEERING—TIME TABLE.  
First Semester.

Hour	Year	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9—10	3	Mech. 1	Mech. 1	Mech. 1	Mech. 1	Mech. 1	Mineralogy
	4	Hydraulics	Mill Const.	Hydraulics	Mill Const.	Hydraulics	O. D. Lab.
10—11	3	Mine Surv.	Prin. Met.	Mineralogy	Prin. Met.	Mineralogy	Mineralogy
	4	Elec. Mach.	Econ. Geol.	Elec. Mach.	Econ. Geol.	Elec. Mach.	O. D. Lab.
11—12	3	Theor Engines	Thermo. 1 A	Thermo. 1-A	Thermo. 1-A	Thermo. 1-A	Mineralogy
	4	N. F. Met.	Comp. Air	N. F. Met.	Comp. Air	N. F. Met.	O. D. Lab.
12—1	3		M. S. & P. T.		M. S. & P. T.		Mineralogy
	4	Ore Dress.	Economics	Ore Dress	Economics		
2—3	3		Mine Map	Mech. Eng. Lab.	Qual. Anal.	Qual. Anal.	
	4	M. P. Design	Elec. Eng. Lab.		Hydr. Lab.		
3—4	3		Mine Map.	Mech. Eng. Lab.	Qual. Anal.	Qual. Anal.	
	4	M. P. Design	Elec. Eng. Lab.		Hydr. Lab.		
4—5	3		Mine Map	Mech. Eng. Lab.	Qual. Anal.	Qual. Anal.	
	4	M. P. Design	Elec. Eng. Lab.		Hydr. Lab.		
5—6	3 & 4		Mil. Train.		Mil. Train.		

MINING ENGINEERING—TIME TABLE  
SECOND SEMESTER.

Hour	Year	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9—10	3	Mech. II	Struct. 1-A	Mech. II	Struct. 1-A	Mech. II	Assaying
	4	Mining	Mining	Mining	Mining	Mining	O. D. Lab.
10—11	3	Struct. Geol.		Struct. Geol.		Struct. Geol.	Assaying
		Elec. Mach.	Econ. Geol.	Elec. Mach.	Econ. Geol.	Elec. Mach.	O. D. Lab.
11—12	3	Met. 1 & 5	Quant. Anal.	Met. 1 & 5	Assaying	Met. 1 & 5	Assaying
	4	Ore Dress.	Mining	Ore Dress.		Mining	O. D. Lab.
12—1	3	Tech. Writing	M. S. & P. T.	Tech. Writing	M. S. & P. T.		Assaying
	4		Economics	Contr. & Spec.	Economics		O. D. Lab.
2—3	3	Quant. Anal.		Test Mtls.	Quant. Anal.	Quant. Anal.	
	4	M. P. Design	Elec. Eng. Lab.	Met. Lab.	M. P. Design		
3—4	3	Quant. Anal.		Test. Mtls.	Quant. Anal.	Quant. Anal.	
	4	M. P. Design	Elec. Eng. Lab.	Met. Lab.	M. P. Design		
4—5	3	Quant. Anal.		Test. Mtls.	Quant. Anal.	Quant. Anal.	
	4	M. P. Design	Elec. Eng. Lab.	Met. Lab.	M. P. Design		
5—6	3 A		Mil. Train.		Mil. Train.		
	4						

## GRADUATES OF THE NOVA SCOTIA TECHNICAL COLLEGE.

1910

Name	Home Address	Degree
F. R. Archibald . . . . .	Halifax, N. S. . . . .	Civil Engineering
F. M. Dawson . . . . .	Truro, N. S. . . . .	Civil Engineering . . . . .
C. L. Dimock . . . . .	Upper Newport, N. S. . . . .	Civil Engineering
T. W. Hardy, Jr. . . . .	Halifax, N. S. . . . .	Mining Engineering
E. S. Kent . . . . .	Truro, N. S. . . . .	Civil Engineering
A. G. McAulay . . . . .	Glace Bay, N. S. . . . .	Civil Engineering
* N. W. McKay . . . . .	Balmoral Mills . . . . .	Mining Engineering
Walter Putnam . . . . .	Maitland, N. S. . . . .	Civil Engineering
E. L. Thorne, Jr. . . . .	Dartmouth, N. S. . . . .	Civil Engineering

\*Not granted full diploma.

1911

Name	Home Address	Degree
H. F. Bober . . . . .	Windsor, N. S. . . . .	Electrical Engineering
J. L. Cavanagh . . . . .	New Glasgow, N. S. . . . .	Mining Engineering
K. G. Chisolm . . . . .	Halifax, N. S. . . . .	Civil Engineering
D. M. Collingwood . . . . .	Upper Parkstone, Eng. . . . .	Mining Engineering
T. M. DeBlois . . . . .	Halifax, N. S. . . . .	Electrical Engineering
C. K. Hood . . . . .	Yarmouth, N. S. . . . .	Electrical Engineering
J. F. Lumsden . . . . .	Gabarus, C. B. . . . .	Electrical Engineering
R. W. McColough . . . . .	Waverly, N. S. . . . .	Civil Engineering
*C. H. MacDonald . . . . .	Sydney, C. B. . . . .	Civil Engineering
J. A. MacKay . . . . .	Balmoral Mills, N. S. . . . .	Civil Engineering
L. A. Mylius . . . . .	Halifax, N. S. . . . .	Mining Engineering
Gordon S. Stairs . . . . .	Halifax, N. S. . . . .	Civil Engineering

\*Deceased

## GRADUATES OF THE NOVA SCOTIA TECHNICAL COLLEGE.

1912

Name	Home Address	Degree
*G. V. Boone.....	St. Johns' Nfld.....	Electrical Engineering
D. R. McKean.....	West La Have, N. S....	Civil Engineering
C. E. McKenzie.....	Springhill, N. S.....	Mining Engineering
Ranald McKinnon.....	New Aberdeen, N. S....	Civil Engineering
J. W. Morrison.....	Oldham, N. S.....	Mining Engineering
C. B. North.....	Hantsport, N. S.....	Mining Engineering
G. F. Simpson.....	Halifax, N. S.....	Electrical Engineering

\*Deceased

1913

Name	Home Address	Degree
R. B. Carson.....	Dartmouth, N. S.....	Electrical Engineering
O. S. Cox.....	Upper Stewiacke, N. S..	Civil Engineering
C. S. Creighton.....	Dartmouth, N. S.....	Civil Engineering
H. W. L. Doane.....	Halifax, N. S.....	Civil Engineering
J. D. Irving.....	New Glasgow, N. S....	Mechanical Engineering
L. B. McCurdy.....	Truro, N. S.....	Civil Engineering
H. S. McKean.....	North Sydney, N. S....	Electrical Engineering
I. P. McNab.....	Upper Malagash, N. S...	Mechanical Engineering
W. H. Noonan.....	Pictou, N. S.....	Civil Engineering
J. P. Norrie.....	Truro, N. S.....	Mining Engineering
M. H. O'Brien.....	Springhill, N. S.....	Mining Engineering
F. H. Palmer.....	Halifax, N. S.....	Civil Engineering

GRADUATES OF THE NOVA SCOTIA TECHNICAL COLLEGE.

1914

Name	Home Address	Degree
E. W. G. Chapman.....	Halifax, N. S.....	Civil Engineering
R. P. Donkin.....	Halifax, N. S.....	Mechanical Engineering
C. A. DeWitt Fowler...	Halifax, N. S.....	Civil Engineering
S. W. Gray.....	Westville, N. S.....	Civil Engineering
H. W. Mahon.....	Great Village, N. S.....	Civil Engineering
J. P. Messervey.....	Halifax, N. S.....	Mining Engineering
*D. R. Munro.....	Amherst, N. S.....	Electrical Engineering
R. Murray.....	Springhill, N. S.....	Electrical Engineering
T. J. MacKavanagh....	Shawinigan Falls, P. Q..	Electrical Engineering
R. B. Roach.....	Windsor, N. S.....	Electrical Engineering
K. E. Whitman.....	Petite Riviere, N. S.....	Civil Engineering

1915

Name	Home Address	Course
Robert Porter Freeman..	Halifax, N. S.....	Civil Engineering
Rupert Melvin Kinnie...	Berwick, N. S.....	Civil Engineering
Angus Ernest McPhie...	West Bay, C. B.....	Civil Engineering
James Welton Spence...	St. Croix, N. S.....	Civil Engineering
C. H. P. Williston.....	Halifax, N. S.....	Civil Engineering
William E. Jefferson...	Lawrencetown, N. S.....	Electrical Engineering
Olin Edman Prestwood..	Sydney Mines, N. S.....	Electrical Engineering & Mechanical Engineering
*Donald Rice Munro...	Amherst, N. S.....	Mechanical Engineering
Waldo Perley Crowe....	Wolfville, N. S.....	Mining Engineering

\*Deceased

1916

Name	Home Address	Course
J. R. Chipman.....	Kentville, N. S.....	Civil Engineering
James B. Hayes.....	Halifax, N. S.....	Civil Engineering
Rowland C. Moore.....	Halifax, N. S.....	Civil Engineering
Richard L. Nixon.....	Kentville, N. S.....	Civil Engineering
John J. Sears.....	Antigonish, N. S.....	Civil Engineering
Leslie C. Strickland.....	Trenton, N. S.....	Civil Engineering
William H. Chisholm....	Halifax, N. S.....	Mechanical Engineering
Clarke, O. Noble.....	New York, U. S. A.....	Mining Engineering

1917

Name	Home Address	Course
Kenneth L. Dawson....	York, P. E. I.....	Civil Engineering
Samuel K. Payzant.....	Falmouth, N. S.....	Civil Engineering

1918

Name	Home Address	Course
Joseph Henry Ryan....	Halifax, N. S.....	Civil Engineering
Joseph C. Ells.....	Selma, Hants Co. N. S..	" "
Wallace Wyniard Smith.	Lunenurg, N. S.....	" "
John H. T. Morrison....	Woodstock, N. B.....	" "
Robert John Cragg.....	Halifax, N. S.....	Mechanical Engineering

# TECHNICAL COLLEGE

103

1920

Name	Home Address	Course
Dale Milner Farnham...	Bridgewater, N. S. ....	Civil Engineering
Stephen Lloyd Fultz....	Halifax, N. S. ....	Civil "
William Gathorne Hardy	Montreal, P. Q. ....	Civil "
John Howard Hickey....	Halifax, N. S. ....	Civil "
Albert E. Macdonald...	Halifax, N. S. ....	Civil "
John Angus Macdonald	Sherbrooke, N. S.	Civil "
Gerald Alexander Boate.	Maitland, Hts. Co. N. S.	Mechanical Engineering
Carleton A. Canavan...	Windsor, N. S. ....	Mechanical "
John H. Macdonald....	Sydney Mines, N. S. ....	Mechanical "
Walter Ross Clarke....	Joggins, N. S. ....	Mechanical "
Gerald Louis Jones....	Port Greville, N. S. ....	Electrical "
David A. Y. Colquhoun.	Halifax, N. S. ....	Mining "

## SHORT COURSES.

### RECIPIENTS OF DIPLOMAS.

1911

Name	Home Address	Course
W. H. Hooke.....	Halifax, N. S. ....	Land Surveying
R. A. Logan.....	Middle Musquodoboit, N. S.	Land Surveying
R. J. Macdonald.....	Halifax, N. S. ....	Land Surveying
R. J. Milgate.....	Middleton, N. S. ....	Land Surveying
P. G. Morrow.....	Halifax, N. S. ....	Land Surveying

1912

Name	Home Address	Course
Lindsay K. Patterson	Aylesford, N. S. ....	Land Surveying
Chas. F. Whitman.....	Halifax, N. S. ....	Land Surveying
A. M. Foster.....	Bridgetown, N. S. ....	Land Surveying
Raymond Chisholm....	Harbor Bouche, N. S. ...	Land Surveying
Daniel A. Gasper.....	Truro, N. S. ....	Land Surveying
J. O. Hunton.....	Sackville, N. B. ....	Land Surveying

## SHORT COURSES.

## RECIPIENTS OF DIPLOMAS.

1913

Name	Home Address	Course
*William L. Brine.....	French Village, N. S. ....	Land Surveying
Vincient, R. E. Harrison.	Southampton, N. S. ....	Land Surveying
Freeman Tupper.....	Milton, N. S. ....	Land Surveying
Harry E. McDonald....	D'Esouse, C. B. ....	Land Surveying

\*Deceased.

1914

Name	Home Address	Course
G. W. G. Allen.....	Halifax, N. S. ....	Land Surveying
Peter Baxendale.....	Sydney Mines, N. S. ....	Land Surveying
Thomas H. Benthon....	Sydney Mines, N. S. ....	Land Surveying
Frank P. Brennan.....	Halifax, N. S. ....	Land Surveying
James A. Donovan.....	Halifax, N. S. ....	Land Surveying
Reginald Dickie.....	Brookfield, N. S. ....	Land Surveying
Edwin Dorey.....	Dartmouth, N. S. ....	Land Surveying
Bertram Padmore.....	England.....	Land Surveying
G. A. Robertson.....	Barrington Passage....	Land Surveying
F. H. Zwicker.....	Lunenburg, N. S. ....	Land Surveying
Arnold R. Millburn....	Sydney Mines, N. S. ....	Metallurgy of Steel

# TECHNICAL COLLEGE

105

## SHORT COURSES.

### RECIPIENTS OF DIPLOMAS.

1915

Name	Home Address	Course
Enna Elm Dauphinee...	Hubbards.....	Land Surveying
Robert Keyes DeLong..	Shannon, N. B.....	Land Surveying
Frank Andrew Grant...	Halifax.....	Land Surveying
Bert Grantmeyer.....	Sydney.....	Land Surveying
James Frederick Kelly..	Stellarton.....	Land Surveying
Henry Harris Miller...	Halifax.....	Land Surveying
Donald McAskill.....	Stellarton.....	Land Surveying
John Angus McLellan...	Bellecote, C. B.....	Land Surveying
Stanley Robert Prest...	Bedford.....	Land Surveying
Arthur Hugh Thomson...	Halifax.....	Land Surveying
Robert Stark Winton...	Stellarton.....	Land Surveying
Edward G. Maxwell.....	Halifax.....	Electrical Machinery
Clarence M. McKay....	New Glasgow.....	Struc. Steel Drafting
Frederick J. Cumming...	Halifax.....	Steam Engineering
William R. Dand.....	New Glasgow.....	Steam Engineering
Thomas D. Martin.....	Halifax.....	Steam Engineering
Charles C. Brynes.....	Baddeck.....	Architectural Drafting
Robert Morton, Jr.....	Halifax.....	Architectural Drafting

1916

Name	Home Address	Course
Peter G. Boutilier.....	French Village.....	Land Surveying
Stephen M. Fulton.....	Sydney.....	Land Surveying
John C. Walker.....	Halifax.....	Land Surveying
Harold Short.....	Halifax.....	Electrical Machinery
Ed. T. MacA. Morgan...	Smith's Cove.....	Electrical Machinery
Gordon M. Totten.....	Sydney.....	Electrical Machinery
James W. Douglass.....	Glengarry.....	Architectual Drawing
William H. Gunn.....	East River, St. Mary's..	Architectual Drawing
Charles C. Brynes.....	Baddeck.....	Architectual Drawing 2nd year.

## SHORT COURSES.

1917

Name	Home Address	Course
Thomas Hume Hay.....	Glace Bay, N. S.....	Architectual Drawing
John Birmingham.....	Sydney Mines, N. S.....	Est. & Building Con.
James Willis Douglas....	New Glasgow, N. S.....	Est. & Building Con.
Jos. Daniel MacDonald..	Halifax, N. S.....	Land Surveying
Warren Sibley Grant....	Shubenacadie, N. S.....	Land Surveying
Howard Allen Roberts..	Moncton, N. B.....	Structural Drafting

1919

## REGULAR STUDENTS REGISTERED 1919-20.

Name	Home Address	Course
Raymond Donald Stiles..	Pictou, N. S.....	Mount Allison
Edgar Stanley Bishop...	Paradise, N. S.....	Acadia
Arthur Felix Inglis.....	Halifax, N. S.....	St. Mary's
John Angus Macdonald..	Sherbrooke, N. S.....	Dalhousie
Stephen Lloyd Fultz....	Halifax, N. S.....	Dalhousie
Walter Ross Clarke.....	Joggins, N. S.....	Mount Allison
Gerald Louis Jones.....	Port Greville, N. S.....	Kings
Andrew Leo Doucette....	Yarmouth, N. S.....	Dalhousie
Thos. Hinson Winter....	St. Johns, Nfld.....	Kings
Ralph Strathie Millett..	Windsor, N. S.....	Kings
David A. Y. Colquhoun..	Halifax, N. S.....	Dalhousie
Dale Milner Farnham....	Bridgewater, N. S.....	Mount Allison
Kenneth Mackenzie.....	Malagash, N. S.....	Mount Allison
Geo. Raymond Holmes...	Hamilton, Bermuda...	Dalhousie
Harold R. Theakston....	Sydney, N. S.....	Dalhousie
Thomas Bishop Kerr....	Halifax, N. S.....	St. Mary's
John Howard Hickey....	Halifax, N. S.....	St. Mary's
Malcolm J. MacMillan...	Marion Bridge, C. B....	Dalhousie
Charles F. Robertson...	North Sydney, N. S.....	Mount Allison
Clyde Oliver Whitman...	New Albany, N. S.....	Acadia
Monson Fraser Goudge...	Windsor, N. S.....	Kings
Donald MacD. Stewart...	Clifton, N. S.....	Acadia
Albert E. Macdonald....	Halifax, N. S.....	Dalhousie
Kenneth N. Buchanan...	Jersey Cove, N. S.....	Dalhousie
J. Herbert MacDonald...	Sydney Mines, N. S.....	Dalhousie
Carleton A. Canavan....	Windsor, N. S.....	Kings
Carl Reginald Welton...	Tremont, N. S.....	Acadia
Luke Bernard Feetham...	Halifax, N. S.....	St. Mary's

## SPECIAL STUDENTS.

Jas. Garfield Sipprell....[Halifax, N. S.....]



